OFFICE ENGINEER

# SUPPLEMENT No. 2

TO

# STATE OF NEVADA
# DEPARTMENT OF HIGHWAYS

# STANDARD SPECIFICATIONS

1946 Edition

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Certain amendments, revisions and additions to the "Standard Specificaions," 1946 Edition have been adopted and shall hereafter be referred to as Supplement No. 2. Said Supplement No. 2 supersedes and replaces Supplement No. 1 adopted in August, 1953. The aforesaid amendments, revisions and additions are hereinafter contained and they shall supersede any conflicting provisions of the "Standard Specifications."

The amendments, revisions and additions contained in said Supplement No. 2 shall become effective on the 28th day of November, 1955.

H.D. MILLS
State Highway Engineer

By: A.G. Kinne

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Engineer of Design

SUPPLEMENT NO. 2

TO THE

STANDARD SPECIFICATIONS

(Edition of 1946)

PART I

GENERAL REQUIREMENTS

CHANGE ENTIRE SPECIFICATION TO READ:

## SECTION 1 - DEFINITIONS AND TERMS

Wherever in these specifications, or in other contract documents the following terms or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

1.1 Abbreviations. Wherever the following abbreviations are used in the specifications or on the plans, they are to be construed the same as the respective expressions represented:

A.A.S.H.O. American Association of State Highway Officials.
A.R.E.A. American Railroad Engineering Association.
A.S.C.E. American Society of Civil Engineers.
A.S.T.M. American Society for Testing Materials.
A.W.S. American Welding Society.
A.W.P.A. American Wood Preservers Association.
S.A.E. Society of Automotive Engineers.

1.2 Advertisement. The advertisement for proposal for all work or materials on which bids are to be accepted.

1.3 Award. The decision of the department to accept the proposal of the lowest responsible bidder for the work, subject to the execution and approval of a satisfactory contract therefor and bond to secure the performance thereof, and to such other conditions as may be specified or otherwise required by law.

1.4 Bidder. Any qualified individual, firm or corporation formally submitting a proposal for the work contemplated, or any portion thereof, acting directly or through a duly authorized representative.

1.5 Bridge. A structure, including supports, erected over a depression or an obstruction, as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads and having a length measured along the center of the roadway of more than twenty (20) feet between under-copings of abutments or extreme ends of openings for multiple boxes and pipes where the clear distance between openings is less than half of the smaller contiguous opening.

Length - The length of a bridge structure is the over-all length measured along the line of survey stationing back to back of backwalls of abutments, if present, otherwise end to end of the bridge floor; but in no case less than the total clear opening of the structure.

Roadway Width - The clear width measured at right angles to the longitudinal center line of the bridge between the bottom of curbs or guard timbers or in the case of multiple height curbs, between the bottoms of the lower risers.

1.6 Calendar Day. Any day shown on the calendar.

1.7 Center Line. The center line as laid out and staked by the engineer.

1.8 Change Order. A written order to the contractor, signed by the engineer, ordering a change in the work from that originally shown by the plans and specifications. If the work is of a nature involving an adjustment of unit price, a supplemental agreement shall be executed. Change orders duly signed and executed by the contractor constitute authorized modifications of the contract.

1.9 Channel. A natural or artificial water course.

1.10 Contract. The written agreement executed between the department and the successful bidder, covering the performance of the work and the furnishing of labor and materials, by which the contractor is bound to perform the work and furnish the labor and materials, and by which the department is obligated to compensate him therefor at the mutually established accepted rate or price. The contract shall include the notice to contractors, proposal, contract form and contract bond, these specifications, supplemental specifications, all general or special provisions, general and detailed plans, and notice to proceed, also any written change orders and agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.

1.11 Contract Bond. The approved form of security, executed by the contractor and his surety or sureties, guaranteeing complete execution of the contract and all supplemental agreements pertaining thereto and the payment of all legal debts pertaining to the construction of the project.

1.12 Contract Amount. The estimated contract cost computed on the basis of the proposal quantities and contract unit prices.

1.13 Contract Item (Pay Item). An item of work specifically described and for which a price, either unit or a lump sum, is provided. It includes the performance of all work and the furnishing of all labor, equipment, and materials, described in the text of a specification item included in the contract or described in any subdivision of the text of the supplemental specifications or special provisions of the contract. In these specifications, the contract items are numbered to correspond to sections, and each contract item shall be constructed under the specification contained in the section of the corresponding number.

1.14 Contractor. The party of the second part to the contract; which shall be the individual, firm, or corporation undertaking the execution of the work under the terms of the contract and acting directly or through his, their, or its agents or employees.

1.15 Culvert. Any structure not classified as a bridge which provides an opening under any roadway.

1.16 Department. The party of the first part to a contract for highway improvement; the State highway department as constituted under the laws of the State of Nevada, for the administration of highway work.

1.17 Directors. The directors of the Department of Highways of the State of Nevada as established by law, acting directly or through their authorized representatives.

1.18 Divided Highway. A highway with separated roadways for traffic in opposite directions.

1.19 Employee. Any person working on the project mentioned in the contract of which these specifications are a part, and who is under the direction and control, or receives compensation from the contractor or his subcontractor.

1.20 Engineer. The State Highway Engineer of the State of Nevada, who is the executive officer of the Department of Highways, or an assistant or other representative duly authorized by the State Highway Engineer to act for him.

1.21 Equipment. All machinery, tools and apparatus, together with the necessary supplies for upkeep and maintenance, necessary for the proper execution of the work.

1.22 Extra Work. Work or material, the performance or furnishing of which is found necessary for the proper completion of the improvement, but which is not covered by any item of the proposal and for which no means of payment direct or indirect has been provided in the contract.

1.23 Highway. A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way.

1.24 Holidays. In the State of Nevada, these occur on:

January 1 (New Year's Day)
May 30 (Memorial Day)
July 4 (Independence Day)
First Monday in September (Labor Day)
October 31 (Nevada Day)
November 11 (Veterans' Day)
Thanksgiving Day
December 25 (Christmas Day)

or on any day that may be appointed by the President of the United States or by the Governor of Nevada for public fast, thanksgiving or holidays.

If any holiday listed above falls upon a Sunday, the following Monday shall be considered a holiday.

1.25 Inspector. The authorized representative of the engineer assigned to make any or all inspections of the work performed and the materials furnished by the Contractor.

1.26 Laboratory. The established laboratory of the department or other laboratory designated by the engineer.

1.27 Major Item. Any contract item having an original contract value in excess of ten percent (10%) of the original contract amount.

1.28 Materials. Any substances specified for use in the construction of the project.

1.29 Median. The portion of the divided highway separating the traveled ways for traffic in opposite directions.

1.30 Notice to Contractors. The official notice inviting bids for the proposed work.

1.31 Notice to Proceed. A written notice to the contractor designating the date on which he shall begin prosecution of the work.

1.32 Plans. The official approved plans, profiles, typical cross sections, working drawings and supplemental drawings, or reproduction thereof, which show the location, character, dimensions, and details of the work to be done, and which are to be considered as a part of the contract supplementary to these specifications and which are indentified on the proposal form.

1.33 Project. The specific section of highway together with all appurtenances and construction to be performed thereon under the contract.

1.34 Proposal. The offer of the bidder, submitted on the prescribed proposal form, to perform the work and to furnish the labor and materials at the prices quoted by the bidder.

1.35 Proposal Form. The approved form upon which the Department requires formal bids to be prepared and submitted for the work.

1.36 Proposal Guaranty. The security furnished by the bidder with his proposal, as a guaranty he will enter into a contract and furnish the required bond for the work if his proposal is accepted.

1.37 Right of Way. The land, property or interests therein, acquired for or devoted to highway purposes.

1.38 Roadbed. That portion of the roadway between outside shoulder lines, or between curbs.

1.39 Roadway. That portion of the right of way required for construction.

1.40 Shoulder. The portion of the roadbed contiguous with the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

1.41 Skew or Skew Angle. The acute angle formed by the intersection of a line normal to the center line of the roadway with a line parallel to the face of the abutments, or in the case of culverts with the center line of the culverts.

1.42 Special Provisions. Special directions, provisions or requirements, peculiar to the project under consideration and not otherwise thoroughly or

satisfactorily detailed or set forth in the specifications. Special provisions shall prevail over specifications and supplemental specifications whenever in conflict therewith and over all plans. They set forth the final contractual intent as to the matter involved.

1.43 Specifications. The general term comprising all the directions, provisions and requirements contained herein, together with such as may be added or adopted as supplemental specifications or special provisions, all of which are necessary for the proper performance of the contract.

1.44 State. The State of Nevada acting through its authorized representatives.

1.45 Structures. Bridges, culverts, catch basins, drop inlets, retaining walls, cribbing, manholes, end-walls, buildings, sewers, service pipes, underdrains, foundation drains and other features, which may be encountered in the work and not otherwise classed herein.

1.46 Subcontractor. Any individual, firm or corporation to whom the contractor, with the written consent of the Department, sublets any part of the contract.

1.47 Subgrade. The portion of the roadbed prepared as a foundation for the base courses, curb and gutter and the surface course.

1.48 Substructure. All of that part of the structure below the bearings of simple and continuous spans, skewbacks of arches and tops of footings of rigid frames, together with the backwalls, wingwalls and parapets.

1.49 Superstructure. All of that part of the structure above the bearings of simple and continous spans, skewbacks of arches and tops of footings of rigid frames, except as noted above for substructure.

1.50 Superintendent. The executive representative of the contractor present on the work at all timesduring progress to supervise and direct the construction, authorized to receive and fulfill instructions from the engineer and to accept orders for changed and extra work.

1.51 Supplemental Agreement. A written agreement made and entered into by and between the contractor and the department covering work not otherwise provided for, revisions in or amendment to the terms of the contract, or conditions specifically prescribed in the specification as requiring supplemental agreements. Such supplemental agreements become a part of the contract when approved and properly executed.

1.52 Supplemental Specifications. Specifications adopted subsequent to the publication of this book. They generally involve new construction items or substantial changes in the approved specifications. Supplemental specifications shall prevail over those published in the Standard Specifications whenever in conflict therewith.

1.53 Surety. The corporate body bound with and for the contractor, for the full and complete performance of the contract, and for payment of all debts pertaining to the work. When applying to the "Proposal Guaranty" it refers to the corporate body which engages to be responsible in the execution of a satisfactory contract by the bidder.

1.54 Traffic Lane. The portion of a traveled way for the movement of a single line of vehicles.

1.55 Traveled Way. The portion of the roadway for the movement of vehicles exclusive of shoulders and auxiliary lanes.

1.56 Work. The furnishing of all labor, materials, tools, equipment and supplies and other incidentals necessary or convenient to the successful completion of the project and the carrying out of all of the duties and obligations as imposed by the contract.

1.57 Working Days. A calendar day, exclusive of Sundays, Saturdays and State recognized holidays, on which weather or other conditions not under the control of the contractor, will permit construction operations to proceed for a period of five (5) daylight hours on the principal item or items of work which would normally be in progress at that time, including final cleaning up as set forth in Article 4.7 of these supplemental specifications.

1.58 Working Drawings. Stress sheets, shop drawings, erection plans, falsework plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, or any other supplementary plans or similar data which the contractor is required to submit to the engineer for approval.

1.59 Work Order. A written order, signed by the engineer, of a contractual status requiring performance by the contractor without negotiation of any sort.

## SECTION 2 - PROPOSAL REQUIREMENTS AND CONDITIONS

2.4 PREPARATION OF PROPOSAL. Change to Read:

The bidder shall submit his proposal upon the blank forms furnished by the Department. The bidder shall specify a unit price in both words and figures for each and every item for which a quantity is given, and shall also show the products of the respective unit prices and quantities, written in figures in the column provided for that purpose, and the total amount of the proposal obtained by adding the amounts of the several items.

All words and figures shall be written in ink or typewritten. In case of a discrepancy between the prices written in words and those written in figures, the written words shall govern.

The bidder's proposal shall be signed with ink by the individual, by one or more members of the partnership, or by one or more of the officers of the corporation submitting it.

2.6 PROPOSAL GUARANTY. Change to Read:

No proposal shall be considered unless accompanied by an undertaking executed by a corporate surety company authorized to do business in the State of Nevada, in an amount equal to five percent (5%) of his bid, or in the alternative every bid shall be accompanied by cash, a cashier's check, or a certified check of the bidder in an amount equal to five percent (5%) of his bid, said check to be made payable to the State Highways

Fund; said undertaking provided for herein, if used to be conditioned to the effect that should the bidder to whom the contract is awarded fail to enter into the contract in accordance with the bid, and to give the bond required by the said contract within fifteen (15) days after notice of such award, said surety company shall forthwith pay into the State Highways Fund the sum set forth in the undertaking.

2.11 COMPETENCY OF BIDDERS. Change to Read:

All bidders shall be prequalified as required by law. To be qualified, a prospective bidder shall submit under oath, on the standard form furnished by the Department, a statement of his financial ability and experience in performing public work. Financial statements shall be prepared and certified by a certified public accountant, or by an accountant who has been previously approved by the Department as being competent to prepare a contractor's financial statement. After verifying the information contained in the statement, the Department shallnotify the submitter of the maximum contract amount and classof work upon which he will be eligible to bid.

Statements of financial ability and experience shall be submitted as of the date upon which the fiscal year of the prospective bidder ends. In order to remain on the qualified list a prospective bidder shall submit a new statement at the close of his fiscal year. A prospective bidder not already qualified shall submit his statement of financial ability and experience at least five (5) full days prior to the date set for the opening of bids in which he is interested in order to have it considered, but qualification shall not be granted until such statement has been verified. Statements shall preferably be submitted at least thirty (30) days prior to bid opening.

No bid will be accepted from, or a contract awarded to, a contractor who is not licensed in accordance with the law under the provisions of Chapter 186, Statutes of 1941, as amended to date, and to whom a proposal form has not been issued by the Department of Highways.

Nothing contained in this section shall be construed as depriving the Department of its descretion in the matter of determining the lowest responsible bidder.

Add the following new Article:

2.14 Gasoline Tax Refund - Motor Fuel Tax Refund. It is understood and agreed that the price bid by the contractor for the work to be done under this contract shall include the State tax on all gasoline, distillate, diesel fuel, and other motor fuels used in the performance of the work, including that used in the operation of stationary engines, tractors, and power shovels, as well as that used in motor vehicles; and it is further agreed, that if any refund of said State tax is received by the contractor or his subcontractors, or employees, on gasoline, distillate, diesel fuel or other motor fuels used in the performance of the work incidental to this contract, the amount thereof shall be credited to the State on amounts due to the contractor under this contract or shall be paid to the State by the contractor in cash.

SECTION 4 - SCOPE OF WORK

Change entire specification to Read:

4.1 Intent of Contract. The intent of the contract is to prescribe a complete

work or improvement which the contractor undertakes to do, in full compliance with the plans, specifications, special provisions, proposal, and contract. They are to be co-operative and what is called for by either is as binding as if called for by both.

Plans represent the conditions as foreseen; however, the various quantities represented thereon may, if necessary, be increased or diminished during construction without impairing the contract.

The contractor shall perform all work in accordance with lines, grades, typical cross section and dimensions and other data shown on the plans or as modified by written orders, including the furnishing of all materials, implements, machinery, equipment, tools, supplies, transportation, labor, and for all other things necessary to the satisfactory prosecution and completion of the project.

4.2 Special Work. Should any construction or conditions which are not covered by the plans or these specifications be anticipated, "Special Provisions" for such work will be prepared by the engineer, stated on insert sheets attached to the proposal forms and such "Special Provisions" shall be considered a part of these specifications the same as though contained herein. Should any such "Special Provisions" or requirements conflict with these specifications or supplements thereto, the "Special Provisions" shall govern.

4.3 Increased or Decreased Quantities of Work. The engineer reserves the right to make, by written order and without notice to surety, such alterations in the plans or character or quantity of the work which may be considered necessary or desirable from time to time during the progress of the work to complete satisfactorily the proposed construction. Such alterations shall not be considered as a waiver of any conditions of the contract or invalidate any of the provisions thereof.

The right is reserved to increase or decrease any or all of the items in the estimate of approximate quantities as shown in the proposal. The length of the project may be increased or decreased by adding or omitting sections or by relocation.

Whenever the termini of the project are changed and whenever any change or combination of changes results in increasing or decreasing theoriginal contract amount as calculated from the bid quantities and contract unit prices by more than twenty-five (25) percent, a supplemental agreement acceptable to both parties to the contract shall be executed in advance of performing the affected work.

Whenever an overrun or underrun of more than twenty-five (25) percent of the original bid quantity for one or more major contract items occur, except items of overhaul, structure excavation, backfill, piling, concrete, seal courses, water, rolling, and such other items as may be specifically excluded in the special provisions, either party to the contract may demand a supplemental agreement be negotiated with an adjustment of unit price or prices satisfactory to both parties. A major contract item shall be defined as any item whose total cost determined by multiplying the proposal quantity and contract unit price, is equal to or greater than ten percent (10%) of the total original contract amount.

Whenever an alteration in character of work involves a substantial change in the nature of the design or in the type of construction which materially increases or decreases the cost of the performance, the work shall be performed in accordance

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with the specifications and as directed, provided however, that before such work is started a supplemental agreement acceptable to both parties to the contract shall be executed.

If it is found that the quantity of any major item required to complete the work underruns or overruns not more than twenty-five (25) percent of the proposal quantity, payment for the work performed will be made at the contract unit price for the quantity of work actually performed.

If it is found that any major item underruns more than twenty-five (25) percent of the original proposal quantity, and as a result thereof the unit cost of performing the work is materially increased, the contractor may submit a request for revision of the contract unit price for such item and shall submit therewith evidence to support his claim. Such claim will be considered insofar as it justifies an increase in the pro rata share of the fixed expenses chargeable to such item because of the decreased quantity of the item, provided, however, no allowance shall be made for anticipated profits on the amount the quantity underruns the original proposal quantity, and further provided, that the total payment for the decreased quantity shall not exceed that which would be made for seventy-five (75) percent of the proposal quantity at the contract unit price.

Revision of any unit price requested by the contractor shall be negotiated on the basis of actual cost plus a reasonable allowance for profit and overhead. Written request for supplemental agreement shall set forth in detail the particulars and character by which the work was changed and by what amount the unit price of the proposal item will be altered. Failure of the contractor to file a request for a supplemental agreement within ten (10) calendar days after any of the above outlined conditions are encountered shall be considered as a waiver thereof on part of the contractor and payment shall be made at the contract unit price for the actual quantity of work performed.

If a supplemental agreement satisfactory to both parties cannot be agreed upon, the engineer may order the work in dispute to be performed on a force account basis or he may cancel the work from the contract.

Changes not requiring negotiated agreements, except as to extra work involved, shall be ordered by means of a contract change order, and acceptance by the contractor, as evidenced by his signature, shall constitute agreement that the change does not involve any adjustment of contract unit prices. Should the nature of the change order be such that the adjustment of contract time for completion as provided in Article 8.6 for increased quantities of work is not equitable, the engineer shall determine the additional time to be allowed, and such time shall be stated on the order. Work shall not be started on any such change until the change order has been delivered to the contractor and accepted by him.

In case the contractor refusss to accept a change order because he considered the change to involve an adjustment of prices, or agreement cannot be reached in regard to price adjustment for a supplemental agreement, the engineer may order the work to proceed and defer settlement of the disputed points.

4.4 Extra Work. Extra work shallbe performed by the contractor, upon receipt of a written order to perform such work, in accordance with the specifications and as directed. Such order shall be on the standard contract change order form. The

order shall state the work to be done, the method of payment and the estimated total cost. The method of payment may be agreed unit prices, force account, or a combination of the two. Agreed unit prices together with the estimated quantities of each unit shall be shown. Orders involving force account work shall be detailed as required in Article 4.5.

Should the nature of the extra work be such that the adjustment of contract time for completion, as provided in Article 8.6 for increased quantities of work, is not equitable, the engineer shall determine the additional time to be allowed, and such time shall be stated on the order.

If it is found necessary during theprogress of the work to exceed the total estimated cost by more than 15 percent, or to use equipment, materials, or items not listed in the order, a supplemental order shall be issued before such additional cost is incurred or such additional equipment or materials are used.

Acceptance of the order by the contractor, as evidenced by his signature, shall constitute his agreement to unit prices or rental rates indicated on the order as agreed prices or rates.

4.5 Force Account Work. When the proposal includes an item or items to be done by force account, or when a supplemental agreement or change order provides for doing certain work by force account, such work shall be performed upon receipt of a written order issued by the engineer. The order shall include the following details:

(a) Statement of work to be done.
(b) Estimated number of hours and estimated hourly wage for each class of labor.
(c) Estimated number of hours and rental rate for all equipment.
(d) Amount and estimated cost of all materials.
(e) Estimated total cost.

The rental rates shall be the contract rates if any, otherwise they shall be agreed rates. In case rental rates cannot be agreed upon, the engineer may so indicate on the order and use for estimate purposes what he considers a fair price, deferring for future settlement the final rates to be used.

If it is found necessary during the progress of the work to exceed the total estimated cost by more than 15 percent, or to use equipment, materials, or items not listed in the order, a supplemental order shall be issued before such additional cost is incurred or such additional equipment or materials are used.

Acceptance of theorder by the contractor, as evidenced by his signature, shall constitute his agreement to unit prices or rental rates indicated on the order as agreed prices or rates.

The plan of work to be followed, the equipment to be used, and the amount and class of labor to be employed shall be determined by the engineer.

4.6 Rights in and Use of Materials Found in the Work. The contractor, with the approval of the engineer, may use on the proposed construction suitable stone, gravel, or sand found in the excavation, and will be paid for the excavation of such

materials at the corresponding contract unit price therefor, but he shall replace at his own expense with other acceptable material all that portion of the materials so removed and used as was contemplated for use in the embankments, backfills, approaches, or otherwise. No charge for materials so used shall be made against the contractor except the replacement herein provided for. The contractor shall not excavate or remove any material from withinthe highway right of way which is not within the excavation as indicated by the slope and grade lines, without written authorization from the engineer.

4.7 Final Cleaning Up. Before final acceptance, the contractor shall remove or obliterate, insofar as feasible, all objects or disturbances of the ground which mar the landscape and were caused by his operations,but which are not part of the improvement. This shall be required on all areas used or occupied by the contractor, regardless of right of way limits.

Rubbish, excess material, temporary structures, and discarded equipment shall be collected and burned, buried, or otherwise disposed of as directed by the engineer. Pits or trenches for equipment set-ups or camp sites shall be filled and the ground restored,insofar as feasible, to its original condition. Temporary haul roads shall be scarified and bladed to blend with surroundings. Pits from which materials have been obtained shall be dressed and shaped to conform with the surrounding ground. Waste shallbe removed from the tops of banks and placed in the bottom of the pit. Except on steep sidehills, the banks of pits shall be cut to not steeper than one to one slope to blend with the natural contours. Bottoms of pits shall be reasonably smooth and level. All other disturbances shall be removed or corrected as directed by the engineer.

## SECTION 5 - CONTROL OF THE WORK

Add the following new Article:

5.11 Load Restrictions. In hauling materials for incorporation in portions of highways under construction or reconstruction, hereinafter called the project, loads which are in excess of the limits set by the Department will not be permitted on any new or existing bridge or bituminous surface which is to remain in place for vehicular traffic within the project or between the project and the pits or other sources of materials designated by the Department for use on the project. Load limits established by the Department for the project shall be complied with regardless of the source of materials, whether from designated pits, approved pits or commercial sources.

## SECTION 6 - CONTROL OF MATERIALS

6.2 Local Materials. Change to Read:

Possible sources of local materials may be designated in the special provisions and the grading analyses of samples shown. The quality of material in such deposits will be acceptable in general, but the contractor shall determine for himself the amount of equipment and work required to secure a finished product meeting the specifications, and whether blending with other local materials will be necessary. It shall be understood that it is not feasible to ascertain from samples an average grading analysis for an entire deposit, and that wide variations from the

grading shown shall be considered as usual and to be expected. It shall also be understood that the engineer may order procurement of material from any portion of any area designated as a pit site, and may reject portions of the deposit as unacceptable.

When material deposits are not designated in the special provisions, the contractor shall provide sources of material acceptable to the engineer.

The Department will endeavor to determine the ownership,royalty payment, and to acquire an option for the right to take materials from those sources designated on the plans or described under the Special Provisions. However, the contractor must negotiate and enter into a written agreement with the owners of material deposits whether they are designated as described herein, or are deposits selected by the contractor. Prior to removing any material two executed copies of the agreement shall be furnished the engineer, one of which is to be forwarded to the Right of Way Engineer, Carson City, Nevada. Use of materials in the work shall not be permitted until the contractor has complied with the above requirements.

The contractor shall reimburse the named owner for all material taken from any source, the amounts thereof to be determined by the engineer, and the rate to be that specified in the executed agreements. If the contractor fails to make the required payments, deductions sufficient to cover the cost of the materials will be made from any moneys due him.

When designated deposits are located on government lands and have been withdrawn by the State as shown by the withdrawal application number on the Deposit Sketch, the agreements mentioned above will not be required. If the contractor selects a deposit on government lands other than that designated, he shall locate a placer claim in accordance with the mining laws of the State of Nevada.

When designated material deposits are shown on the plans or in the Special Provisions, the contractor shall not use material from another deposit until written approval of the change has been received from the engineer. It is understood that approval of a deposit other than designated will not increase the cost of the work. The engineer assumes no responsibility for the quantity of acceptable material in such deposits.

In case a designated deposit fails to contain the quantity of acceptable material indicated in the special provisions, the contractor shall immediately notify the engineer in writing. The engineer shall thereupon investigate, and if his investigation shows that there is not a sufficient quantity of acceptable material, he shall designate an alternate deposit from which to obtain the deficit. In such case, an adjustment of compensation shall be made as provided in Article 9.6.

Deposits which will impair the appearance of the roadside, more than if the material were taken from a designated deposit will not be approved. Generally, deposits located within five hundred (500) feet from the center line of the roadway, will not be approved.

## SECTION 7 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

7.1 Laws to be Observed. Add the following:

The attention of the bidder is invited to the fact that this Department has been advised by the Wage and Hour Dividion, U.S. Department of Labor, that contractors engaged in highway construction work are required to meet the provisions of the Fair Labor Standards Act of 1938 (52 Stat. 1060).

Under the Federal Act which imposes a tax of three (3) percent on amounts paid for transportation of property by motor vehicle, rail, water or air, exemption from payment of the tax is allowed where property is transported to or from a government of a state or other political subdivision, or an agency or instrumentality thereof, and the shipping papers show the consignor or consignee to be such an organization. In order that the State may benefit from the exemption thereby allowed, the Department of Highways hereby authorizes the Contractor to whom this contract is awarded to have all shipments of materials destined to enter into the work covered by the contract and to become the property of the State, consigned to the State of Nevada, Department of Highways in care of the contractor, and to claim exemption from the transportation tax that would otherwise be imposed on such shipments.

This authority is granted to the Contractor by the Department of Highways with the understanding that the saving to be made by the exercise of this exemption privilege will be reflected in the prices bid for the contract work and will in that manner accrue to the benefit of the State and other governmental agencies by which funds for the work are contributed.

Exemption from the transportation tax does not apply to shipments of fuel, lubricants, spare parts, equipment, plant, consumable supplies, construction forms, form lumber or other items which do not become a part of the completed work or which do not become the property of the State, and the Contractor is not, by these provisions, authorized to use the name of the Department of Highways or the State of Nevada in the consignment of shipments of such items.

The Contractor is cautioned that any misuse of the authority hereby granted, wherein shipments not eligible for exemption hereunder are consigned to the Department of Highways, thereby wrongfully relieving the Contractor of an obligation to pay a transportation tax, is a violation of Federal law, subject to punishment as prescribed therein.

The Contractor will be required to furnish a certificate from the Nevada Industrial Commission as evidence that he has complied with the current provisions of the "The Nevada Industrial Insurance Act" and "Nevada Occupational Diseases Act".

7.9 Preservation and Restoration of Property and Landscape. Add the following:

Prior to constructing haul roads across publicly or privately owned lands, the contractor shall reach an agreement with the owners of the land or with the agency of the United States Government having jurisdiction over such lands relative to the location of the roads. He shall also reach an agreement with such agency having jurisdiction over public lands as to the location and eventual disposal of any wells he may drill in connection with this contract. In areas subject to the spread of halogeton he shall take all reasonable care during the course of construction of the project to avoid any unnecessary disturbance of soil or vegetation within the right of way, along haul roads or at pit sites from which material has been obtained.

7.10 Responsibility for Claims. Add the following:

Reimbursement to contractor by state in whole or in part for costs of protecting traffic shall not serve to relieve the contractor of his responsibility as set forth in the Standard Specifications.

Add the following new Article.

7.15 Fire Prevention and Control. Before setting any fires whatsoever, the contractor shall notify the responsible Federal or State agency having jurisdiction for the area concerned. All burning shall be done at night unless otherwise authorized in writing by the engineer. The contractor shall abide by such rules and instructions as to fire prevention and control as the Forest Service, Bureau of Land Management, State Forester-Fire Warden or other Federal or State agency having jurisdiction may prescribe. The contractor shall take all necessary steps to prevent his employees from setting fires not required in the construction of the project, shall be responsible for preventing the escape of fires set in connection with construction of the project and shall under the direction of the appropriate Federal or State Agency, or, in the absence of an officer from any such agency, acting independently, extinguish all fires set or caused by his employees and all other fires which may so escape the project, whether or not set directly or indirectly as a result of construction operations, without expense to the State or Federal government. Where the contractor is obligated to suppress any fire without expense to the State or Federal government under the provisions of this article, if the amount and character of labor, subsistence, supplies and transportation which the contractor is in a position to furnish promptly for fire suppression prove inadequate for that purpose, in the judgment of the Federal or State agency in charge, then the appropriate officer of such agency is authorized to procure and to charge to the contractor, such additional labor, subsistence, supplies and use of transportation facilities as he may deem necessary for the suppression of the fire. These expenses shall be billed to the contractor for payment directly by him, and if not promptly met by him shall be paid by the Federal or State government and deducted from the moneys due or which may become due the contractor under this contract, or collected from his sureties until the entire amount due the Federal or State government for said fire suppression is recovered.

The contractor shall maintain a fire patrol in the vicinity of blasting and other operations creating a fire hazard. When, in the opinion of the Federal or State agency having jurisdiction, such a patrol is unnecessary because of weather conditions, contractor shall be so notified through the engineer.

## SECTION 8 - PROSECUTION AND PROGRESS

8.1 Subletting or Assigning the Contract. Change 1st and 2nd paragraphs to read as follows:

The contractor shall perform with his own organization and with the assistance of workmen under his immediate superintendence, work of a value not less than fifty (50) percent of the value of all work embraced in the contract exclusive of such items as may be designated in the special provisions which are not commonly found in contracts for similar work. Items so designated shall not be considered major items of the work.

If the bidder shall state in his proposal the particular item or items of work

which he proposes to sublet and shall name therein the subcontractor to whom he proposes to sublet such work in the event of an award to him, such item or items of work may be performed by such subcontractor notwithstanding the fifty (50) percent limitation above mentioned, provided that the subcontractor named in the proposal is a contractor of recognized standing, has a record of satisfactory performance, and the work proposed to be sublet does not constitute the major item or items of work embraced in the contract.

8.3 Limitation of Operations. Add the following paragraph:

No work shall be performed on Saturdays or Sundays, or on the holidays enumerated in article 1.57 of the Supplement, other than is necessary for the protection of the work or traffic, except that in the event the contractor elects to work on Saturdays those days worked will be charged as working days against the allowed time.

## SECTION 9 - MEASUREMENT AND PAYMENT

9.1 Measurement of Quantities. Add the following:

When a complete structure or structural unit (in effect,"lump sum" work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

9.5 Force Account Work. Add the following:

By agreement with the Nevada Branch of the Associated General Contractors of America, fair rental rates for certain types of equipment have been determined. A list of these rates are appended to the Special Provisions. For equipment used on Force Account Work, and for which there is no contract price, the contractor shall accept rates not to exceed those set forth.

9.9 Acceptance and Final Payment. Add the following:

Final acceptance of the contract shall not be made unless all reports required in Article VI of Contract Provisions appended as part of the Special Provisions are completed in acceptable form and filed with the engineer.

PART II

CONSTRUCTION DETAILS

SECTION 10 - ACCOMMODATIONS FOR PUBLIC TRAFFIC

Change entire specification to read:

10.1 Description. This item shall consist of providing accommodations for public traffic be detouring traffic over existing roads, by permitting traffic to pass through construction operations, by constructing and maintaining special detours, or by a combination of these methods as indicated on the plans or in the special provisions or as directed in writing by the engineer.

10.2 Materials. The materials used for the construction and maintenance of facilities required for the free flow of public traffic and for protection of the work shall be those prescribed for the several items which constitute the finished work and shall conform to all the requirements for such materials as set out in Part III "Materials Details" or as otherwise specified.

10.3 General Requirements. Methods of handling traffic, if required, will be shown on the plans or in the special provisions.

No road or section thereof shall be closed to traffic unless provided on the plans, in the special provisions, or permitted by the engineer.

The contractor shall conduct his operations and the use of his equipment in such a manner that two-way traffic will continuously be provided throughout the entire length of the project, including special detours where required.

When conditions are such as to warrant variations from the requirement that two-way traffic be maintained, the exact procedure to be followed shall be approved by the engineer before traffic conditions are changed.

Access shall be permitted to residences, buildings, and driveways adjacent to existing roads, the road under construction, or special detours at all times and the contractor shall provide such temporary approach roads as may be required for this purpose.

When it is necessary for residents living along the project to use a portion of the road under construction, the Contractor shall maintain, within the limits of these specifications, that portion of the road in a suitable condition for such vehicular traffic.

The engineer may authorize a suspension of work when unfavorable weather or other conditions not the fault of the contractor make such a suspension adviseable. During such a suspension the contractor shall make passable and shall open to traffic such portions of the highway under improvement and such temporary roadways or portions thereof as may be agreed upon between the contractor and the engineer for the temporary accommodation of necessary traffic during the anticipated period of suspension. Thereafter, and until an issuance of an order for the resumption of

construction operations, the maintenance of the temporary route or line of travel agreed upon shall be by and at the expense of the State. When work is resumed the contractor shall replace or renew any work or materials lost or damaged because of such temporary use of the highway under improvement; shall remove any work or materials used in the temporary maintenance thereof by the State; and shall complete the improvement in every respect as though its prosecution had been continuous and without interferences. All additional work caused by such suspension shall be paid for by the State at agreed prices or by force account when agreement cannot be reached.

During non-working hours the limits of any hazardous section shall be outlined with markers and flares placed not more than one hundred (100) feet apart. If deemed necessary by the engineer, barricades shall be erected to protect public traffic from such hazardous areas or he may direct the contractor to furnish flagging and piloting, if in his opinion conditions so warrant. Such flagging and piloting shall be done at the contractor's expense, provided, however, that flagging and piloting by the contractor after regular working hours will not be required if the contractor each day will leave the work in such a condition that it can be traveled over without damage to the work and without danger to the traffic. The engineer shall be the judge as to whether or not these conditions are satisfactorily complied with, and as to whether or not flagging and piloting can be dispensed with after working hours.

When the contractor's hauling equipment is required to merge with or cross traffic, and at such other points as may be necessary to maintain safe traffic condition, flagmen shall be provided on each side of the impairment to stop and direct traffic.

All flagmen furnished for the protection of the public and direction of traffic shall perform their duties in a courteous manner with a view to insuring the safety and conveniences of the traveling public within the limits of the guarded area. The contractor shall immediately correct any deficiency in equipment or flagging procedure brought to his attention by the engineer.

Each flagman shall be supplied, for use in daylight, with a red shirt or jacket, red cap and a red flag not less than 18 inches by 18 inches square, mounted on a staff. To stop traffic in daylight, the flagman shall stand at the edge of the traffic lane, facing approaching traffic, with his arm and hand extended into the traffic lane, holding the red flag across the traffic lane. The red flag shall be held without waving so that the full area of the flag is below the staff and visible to the approaching traffic. In daylight, traffic shall be signaled to proceed by lowering the red flag and waving the arm (not the flag) in a forward direction.

Between the hours of sunset and sunrise the flagman shall be supplied with a white shirt or jacket and cap, and shall be equipped with lighted red lanterns or red light torches, and for emergencies, red light fusees. To stop or slow down traffic the red lantern or torch shall be waved back and forth across the field of vision of the drivers of approaching traffic. To signal traffic to proceed, a hand signal or verbal order shall be given.

Whenever it is necessary to divert the flow of traffic from its normal channel into another channel, the channel for such diverted traffic shall be clearly delineated

by temporary markers or small temporary barricades. On tangents the temporary markers or small temporary barricades shall be placed not farther apart than two hundred (200) feet. On curbes, the spacing of the temporary markers shall not be greater than the following:

> Six thousand (6000) foot radius to two thousand (2000) foot radius, two hundred (200) feet; under two thousand (2000) foot radius to nine hundred fifty (950) foot radius, one hundred (100) feet; under nine hundred fifty (950) foot radius to four hundred (400) foot radius, forty (40) feet; under four hundred (400) foot radius, twenty (20) feet.

In case of damage to detours due to storms or other causes, the contractor shall at once repair the damage or provide for carrying traffic through construction operations.

None of the provisions herein shall be construed to restrict or prohibit, at any time, the prosecution of items of work which will not interfere with the use of the existing highway.

10.4 Carrying Traffic Through Construction Operations. Where public traffic is carried through construction, it will be necessary to permit traffic to use a portion of the roadway during progress of the work. Roadway excavation and embankment constructions shall be conducted in such a manner as to provide a reasonably smooth and even surface satisfactory for use of public traffic at all times. If ordered by the engineer, roadway cuts shall be excavated in lifts and embankments constructed part width at a time, construction being alternated from one side to the other side and traffic routed over the side opposite the one under construction. Culverts shall be installed and backfilled one-half width at a time, or at each structure the contractor may construct and maintain, at his own expense, short run-around detours acceptable to the engineer.

Every attempt shall be made to provide adequate width for two (2) lanes of traffic; these traffic lanes shall be kept smooth, free from ruts, holes, rocks, ridges and bumps, by use of equipment, labor, and materials as may be necessary to accomplish this purpose. If, in the opinion of the engineer, the usable roadway is not sufficient to safely accommodate two-way traffic, the contractor shall adequately maintain one-way traffic. Whenever one-way traffic is in effect, the distance shall not be in excess of six thousand (6,000) feet.

Where controlled traffic is necessary for protection of the work or for safety of public traffic, it shall be handled in the following manner:

1. Flagmen will be required and used at all hazardous areas during grading operations.

2. If, in the opinion of the engineer, it is necessary to afford additional protection to the work, workmen or public traffic through construction operations, a pilot car and driver shall be used as he so directs.

3. Flagmen and pilot car and driver will be required as directed by the engineer, when it is indicated on the plans, or provided in these specifications or the special provisions during paving operations and surface treatment.

Pilot cars shall be suitable vehicles in good mechanical condition and shall carry a sign which shall comply with the design and mounting as shown in the standard drawing appended to the special provisions.

Water shall be applied at points and in amounts as directed by the engineer to keep the roadbed firm, smooth, and stable, and reduce the dust hazard to a minimum.

Whenever blasting is necessary, which will interfere with, endanger, or delay traffic, the operations shall be so conducted that traffic will not be delayed for periods longer than twenty (20) minutes. Such blasting shall be done only during hours when the volume of traffic is at a minimum.

The contractor shall maintain all structures or portions of structures in a condition for safe and convenient use. The contractor shall also maintain adequate guard rails, temporary markers, lights, signs, and such other traffic control devices, and flagmen as may be necessary to maintain safe traffic conditions.

The contractor shall maintain the subgrade, unprimed or primed base courses over which traffic is directed. This maintenance shall constitute continuous and effective work prosecuted day by day with adequate equipment and forces to the end that the subgrade or base is kept free from ruts, ridges, holes, and in satisfactory condition at all times.

10.5 Passing Traffic Over Existing Roads. Where traffic is diverted over existing roads, approach roads from the new grade to the old road shall be provided to properly accommodate traffic. Such approach roads shall be constructed to a width comparable to the existing road and shall be constructed in a manner satisfactory to the engineer before beginning work on the corresponding section of the new highway.

The existing road shall be widened and realigned as may be necessary to avoid conflict with the proposed new construction.

The contractor shall be responsible for maintenance of the existing roads used by public traffic during construction and until the project is finally accepted, except for authorized suspensions of the work due to seasonal weather conditions during the winter months, when maintenance shall be by and at the expense of the State. The maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment, and forces to the end that the roadway and structures are kept in satisfactory condition at all times, provided, however, that snow removal will not be required of the contractor for the accommodation of public traffic.

All cost for this maintenance work during construction and beforethe work is finally accepted shall be included in the unitprices bid on the various pay items and the contractor will not be paid an additional amount for such work.

Failure on the part of the contractor, at any time to comply with the provisions above will result in the engineer immediately notifying the contractor, in writing, to

comply with the required maintenance provisions. In event that the contractor fails to remedy unsatisfactory maintenance within the time allowed by the engineer, in his written notice, the engineer will immediately proceed with adequate forces and equipment to maintain the project, and the entire cost of this maintenance will be deducted from monies due or which may become due the contractor under this contract.

When windrowed material is left on the roadbed at night, such windrows shall be moved as far to one side of the roadbed as feasible, and the windrows shall be outlined with flares and reflectorized guide markers placed not more than one hundred (100) feet apart. The windrow shall be flattened at points where traffic has to cross.

10.6 Special Detours. Special detours shall be constructed as shown on the plans or as specified in the special provisions. Detour locations indicated on the plans are approximate only; the exact location shall be as staked by the engineer.

Grading for special detours shall consist largely of blade grader work, supplemented where necessary by other mechanical equipment, to provide the specified roadbed width and a grade line free from breaks or rolls of sufficient magnitude to be hazardous to traffic.

When grading of special detours has been completed and apprved by the engineer and, if required on the plans or in the special provisions, the special detours shall receive surfacing materials of the kind and type specified, and they shall be placed and constructed in accordance with the requirements for the particular materials used.

Water shall be applied to detours in amounts and at points as directed by the engineer to assist in the compaction of graded sections and of surfacing materials.

Maintenance on special detours shall consist largely of filling holes as they develop, adding surfacing, and applying liquid asphalt, blading, watering, and performing any other work necessary to maintain the detour satisfactorily, all as ordered by the engineer.

Upon disturbing the existing roadbed corresponding to a special detour, grading operations shall be prosecuted continuously to completion. Placing of gravel base or surface courses shall immediately follow completion of grading operations; and, in the case of gravel base course, bituminous prime coat shall be applied as soon thereafter as sections of sufficient length are available to permit the application of bituminous material in carload lots. The contractor shall permit traffic to travel over the primed or unprimed base course until such time as the remaining surfacing materials are being placed, at which time, traffic shall again be diverted over the special detours. Maintenance of unprimed or primed base shall be as set forth in Article 10.4. If traffic is diverted over the unprimed base, water shall be applied at such points and in such amounts as to keep the roadbed firm, smooth, and stable, and reduce the dust hazard to a minimum.

After traffic has been turned over the completed new roadbed, temporary detour approach roads and those portions of special detours which are visible and unsightly from the new highway shall be removed and obliterated as directed by the engineer.

10.7 Barricades and Warning Signs. The contractor shallprovide, erect, and maintain all necessary barricades, suitable andsufficient flares or red lights, danger signals and standard warning signs at locations shown on the plans, as set forth in the special provisions, or as directed by the engineer, for the protection of the work, workmen, and guidance and safety of the traveling public. Highways closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning signs. The contractor shall provide and maintain acceptable warning and detour signs at all closures, intersections, and along the detour routes, directing the traffic around the closed portions of the highway so that the temporary detour route or routes shall be indicated clearly throughout its or their entire length. All barricades, signs, and obstructions shall be illuminated at nights, and all lights for this purpose shall be kept burning from sunset to sunrise.

All standard warning signs and barricades shall conform with standard details and "Construction Sign Requirements" appended to the special provisions, and shall be substantially constructed of wood or enameled metal. Wooden signs and barricades shall be painted with a prime, second and third coat of paint in accordance with Section 66. The final coat shall present a smooth semi-gloss finish.

Lettering and design shall be true to detail as shown on the standard details with sharp clear-cut lines and a glossy finish.

Except as set forth below coatings of wide-angle reflecting material applied to the entire background area of the signs shall be used when reflectorized signs are called for. These coating shall be of the same color as indicated for such signs on the standard sign sheets and shall be retro-directive reflecting in character. Before application of the reflective coating, the background shall have been painted as specified above.

Signs indicated with a black background, shall have a black painted background, and the letters, symbols, or numerals shall be white, wide-angle reflecting coatings on the black painted background. The character of these reflective coatings shall be approved by the engineer.

Signs and barricades shall be maintained in first-class condition and any which may become scarred or damaged shall be repaired immediately or replaced as directed by the engineer.

After completion of any portion of the work rendering continued use of the signs or barricades unnecessary, the contractor shall at once remove, move, or change them, as directed by the engineer.

All signs and barricades shall be the property of the contractor and shall be disposed of by him upon completion of the contract.

In addition to the signs and barricades required above, or in the special provisions, the contractor shall furnish and erect, at his own expense, such other signs and safeguards as may be necessary to protect the public traffic, workmen, and the work on account of his operations.

Upon failure of the contractor to immediately provide, erect, and maintain or to move or remove such barricades and the standard signs when ordered so to do by

the engineer, the engineer shall be at liberty without further notice to the contractor or to the surety to provide, erect and maintain or to move or remove barricades and lights and to provide, erect and maintain or to move or remove standard signs and deduct the cost thereof from any payments due or to become due to the contractor.

The responsibility for the protection of the work, workmen, and public traffic will rest with the contractor and he shall be liable for damages and injury suffered by reason of the contractor's operations or any circumstances, conditions, actions, or negligence in connection therewith.

10.8 Alternate Methods. If the contractor desires to handle the work or traffic in a manner different from that outlined above, he shall submit in writing an outline of the plans he proposes. If, in the opinion of the engineer, such plan will provide for handling traffic in a satisfactory manner and at a cost which will not exceed the cost of providing for traffic as outlined above, permission may be granted to substitute the contractor's plan for the method set forth herein. Any changes made under these provisions shall be covered in writing on the department change order forms.

10.9 Method of Measurement and Basis of Payment. Reimbursement for all costs of carrying traffic through construction operation shall be measured and paid for as follows:

When the proposal contains an item of "Flagman" the flagging as specified hereing, in the special provisions, or ordered by the engineer, shall be measured by the number of hours that flagmen are actually used to direct traffic through construction operations, to stop traffic preparatory to piloting operations, and at each point where contractor's equipment enters or interferes with the traffic stream, and shall be paid for at the contract unit price bid per hour for "Flagman", which price shall be full compensation for all equipment, competent personnel and all incidentals necessary for the operation.

When the proposal contains the item of "Pilot Car," the piloting as specified herein, in the special provisions, or as ordered by the engineer, shall be measured by the number of hours that the pilot car and driver are actually used to lead traffic through the controlled areas, and shall be paid for at the contract unit price bid per hour for "Pilot Car," which price shall be full compensation for the vehicle and an experienced driver, all operating costs and depreciation.

If the proposal includes an item of "Maintain Base" it shall be paid for on a force account basis in accordance with Articles 4.5 and 9.5 of these specifications.

If the roadway excavation encountered in the construction of special detours or in the construction and removal of approaches to an existing highway, from the new to the old grade, is deemed sufficient to require mention on the plans or in the special provisions, such excavation shall be measured and paid for as specified under Section 14, "Roadway and Drainage Excavation."

If the proposal contains an item for "Selected Detour Surfacing" in lieu of other materials covered in the standard specifications, selected detour surfacing shall be measured in tons, or cubic yards, in the hauling vehicles at the point of loading, as indicated by the unit stated in the proposal form. "Selected Detour Surfacing," measured as provided above, shall be paid for at the contract unit price bid per ton or cubic yard, as the case may be, which payment shall be full compensation

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for stripping of pit, crushing, screening, loading, hauling, placing materials on roadbed and compacting complete in place.

Liquid Asphalt, if required to prepare a surface for special detours or for laying of dust, shall be measured as specified in Section 32 "Road Application of Liquid Asphalt" and paid for at the contract unit price for the particular type of material required.

All other work necessary for the construction and maintenance of special detours shall be paid for on a force account basis in accordance with Article 4.5 and 9.5, except that equipment for which there is a contract price shall be paid for at the contract unit price bid per hour for the particular item of equipment required. The estimated amount of equipment and number of hours of operation shall be as indicated in the proposal form.

The particular items of equipment indicated in the proposal form, or the equivalent thereof, in good mechanical operating condition shall be paid for at the contract unit price per hour for the particular item of equipment required. The contract unit price bid per hour for equipment shall include skilled operators for each piece of equipment, fuel, lubricants, repairs, depreciation, and all expense incidental to the operation of the equipment. The time allowed for such equipment shall be the actual time the equipment is in operation on the work.

Unless otherwise provided in the special provisions or the proposal includes a contract item, the costs of necessary watchmen, or flagmen, and of furnishing, erecting, maintaining, moving, removing, and replacing any signs or barricades, torches and lights, temporary markers or other devices, and furnishing flagging materials which are required herein, shown on the plans or otherwise ordered, or which may further be necessary for the protection of the traveling public, the work or the contractor's workmen, will not be paid for directly, but the cost thereof shall be included in the various pay items of the contract.

The contract lump sum price for "Signs" shall be full compensation for furnishing, erecting, maintaining, moving, removing, and disposing of the signs and barricades and for all labor, materials, tools, supplies, equipment, and incidentals necessary to complete the work.

When roadmix detours are called for on the plans or in the special provisions, roadmixing shall be done in accordance with Section 37 "Class B-1 Roadmix Surface" or Section 38 "Class C-1 Roadmix Surface" whichever applies.

## SECTION 19 - EMBANKMENTS

19.3 Sequence of Operations: Change to read as follows:

Except as noted below, bridges and culverts shall preferably be completed in advance of grading operations. If not so completed, a sufficient length of embankment, as determined by the engineer, shall be omitted on each side of such structures to permit proper compaction of the embankment adjacent to the structure, in accordance with these specifications, after the structure has been completed.

Material surrounding bridges, pipe or box culverts shall be placed in accordance with the provisions set forth in Section 21 "Backfill".

Unless otherwise directed by the engineer or indicated on the plans, the contractor may, if he so elects, place the embankment before laying any pipe, in which case the embankment shall be placed at least two (2) feet above the proposed elevation of the top of the pipe or to the top of the embankment if this is less than two (2) feet above the proposed elevation of the top of the pipe. The trench shall then be excavated to the width set forth in Section 20 "Structure Excavation" for placing the pipe and proper backfilling. The pipe shall then be laid and the trench backfilled in accordance with the provision of Section 21 "Backfill", before more embankment or other material is placed thereon. If the contractor uses this method Structure Excavation and Backfill will be allowed as though the pipes were laid before placing the embankment.

19.6 Compaction. Change to read as follows:

Unless otherwise directed, where embankments are five (5) feet or less in height and before embankments are placed on natural foundations, except those composed essentially of rock or rocky materials, the top six (6) inches shall be plowed or scarified, moistened and compacted in conformity with the requirements as hereinafter set forth.

Compaction of embankments shall be done with approved pneumatic-tired rollers, multiple smooth-wheeled power rollers, or self-cleaning tamping rollers conforming to the requirements as set forth in Section 28, "Rolling". The type of roller used shall be suited to the character of the soil in the embankment. Types found unsuitable, after trial, in obtaining thorough compaction shallbe replaced by another type when so ordered by the engineer.

The contractor shall provide at least one (1) tamping roller of not less than two (2) units and one (1) pneumatic-tired roller for each three hundred (300) cubic yards or fraction thereof, of material placed an hour. The quantity of material placed per hour shall be determined by averaging the total quantity of material placed in one (1) day or one (1) shift of operation, measured in excavation. Where tamping type rollers are used the contractor shall be permitted to use two (2) tamping rollers of two (2) units each for each four hundred (400) cubic yards, or fraction thereof, of material placed in embankment per hour.

The rolling equipment shall be used when and as ordered by the engineer until the required compaction is obtained. The type of roller or rollers to be used will depend on the nature of the materials being compacted and the selection of type shall be at the descretion of the engineer.

Each layer of earthy materials shall be leveled, rolled and thoroughly compacted to a relative compaction of not less than ninety(90) percent as determined by the compaction test specified in Article 6.4 (d) of these specifications.

Embankment material which is not sufficiently moist to compact shall be sprinkled with water as directed by the engineer, either during excavation or when being placed in embankment. If the embankment material is rock, sufficient water shall be applied to flush the fine particles into the interstices of the rock.

The moisture content of the embankment material at the time of compaction shall be such that the specified density can be obtained.

The top six (6) inches of the completed subgrade, in cuts, shall be compacted to the same density as required for each layer of embankment.

At locations that are inaccessible to the roller, the embankment shall be brought up in layers of the thickness specified above and each layer shall be compacted thoroughly with mechanical tampers or by hand tamping.

The contractor shall use sufficient equipment of the type and weight ordered to obtain the required compaction in all areas including those that are inaccessible to ordinary rolling equipment.

When the proposal contains no item for "Rolling" compaction shall be obtained by routing the hauling and spreading equipment traffic over the embankment area in such a way that all portions of the layer are uniformly covered by the wheels and crawlers.

Embankments shall be maintained true to grade and cross section until the completion of the contract.

## SECTION 21 - BACKFILL

21.3 Placing. Add the following new provision:

After the culvert has been installed backfill shall be placed in horizontal layers not exceeding four inches in depth, before compaction, and of such width that there shall be a berm of thoroughly compacted material on each side of the culvert at least as wide as the diameter of the pipe or outside vertical height of the box, except insofar as undisturbed material protrudes into this area.

21.4 Method of Measurement. Change paragraph (b) to read:

(b) For that portion above the top limits of structure excavation:

For full circle pipe culverts:

The volume to be measured shall not exceed the vertical dimension bounded by the original ground surface, and a horizontal plane six inches above the crest of the pipe; and the horizontal dimension shall be determined by the distance between vertical planes, equal to the diameter of the barrel of the pipe times three, but not in excess of the diameter plus ten feet.

For arch pipe culverts:

The volume to be measured shall not exceed the vertical dimension bounded by the original ground surface, and a horizontal plane six inches above the crest of the pipe; and the horizontal dimension shall be determined by the distance between vertical planes, equal to the horizontal diameter of the pipe plus two times the vertical diameter, but not in excess of the horizontal diameter plus ten feet.

For reinforced box culverts:

The volume to be measured shall not exceed the vertical dimension bounded by the original ground surface and a horizontal plane flush with the top of the structure; and the horizontal dimension shall be determined by the distance between vertical planes outside the walls of the structure, equal to the outside width plus two times the external height of the structure, but not in excess of the outside width plus ten feet.

The volume of the structure contained shall be deducted from the volume of backfill. Backfill above the top limits of structure excavation for headwalls for pipe culverts thirty-six (36) inches or less in diameter shall not be measured or paid for directly.

## SECTION 27 - WATERING

27.3 Construction Methods. Add the following:

The contractor shall make all arrangements for securing water. He shall negotiate with owners of supply and sign an agreement with each owner prior to removing the water. He shall pay all royalties accruing under such agreements and shall also obtain any necessary rights of way for haul roads.

27.4 Method of Measurement. Add the following:

Developing of an adequate water supply, the furnishing of all necessary equipment for obtaining water from the source or sources and the furnishing on the job of equipment necessary to apply the water to the roadway in quantities directed by the engineer shall be measured for payment as a unit.

27.5 Basis of Payment. Change to read:

Furnishing of an adequate water supply, equipment for obtaining water from the sources, and for furnishing applying equipment on the job shall be paid for at the contract lump sum price for "Furnish Water Equipment," which price shall be full compensation for furnishing all labor, materials, tools, supplies, equipment, and incidentals necessary thereto.

The quantity of water acceptably applied to the roadway, measured as provided above, shall be paid for at the contract unit price per one thousand (1000) gallons (M gal) for "Water," which price shall be full compensation for furnishing all labor, materials, tools, supplies, equipment, and incidentals necessary to complete the work.

The Department reserves the right to increase, or to omit all or any part of the estimated amount of water to be used, and no additional compensation shall be allowed by reason of such increase or decrease.

## SECTION 28 - ROLLING

Change entire specification to read:

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28.1 Description. Rolling shall consist of furnishing and operating rolling equipment for the compaction of foundation for embankment, embankment subgrade, gravel base courses, soil-cement base courses, bituminous base courses, and gravel or crushed rock surface courses, but does not include furnishing and operating equipment for the compaction of bituminous surface courses.

28.2 Equipment. The rolling equipment used in the performance of the work shall be capable of consistently obtaining the specified compaction, shall conform to the requirements hereinafter prescribed and shallbe of the type set forth in applicable sections of the specifications.

All rollers shall be in first class mechanical condition, adequately equipped and powered and shall be subject to the approval of the engineer as to type, size and mechanical condition. No roller shall be permitted on any project that does not have displayed thereon in permanent legible characters, the manufacturer's guaranteed weight without ballast. The rollers shall be continuously maintained in first class operating condition throughout their use on the project. Whenever rollers are found unsatisfactory by the engineer they will be changed, replaced, or removed from the work as required by the engineer.

The rolling equipment used in the work performed under applicable sections of the specifications shall comply with the following requirements:

(a) Tandem Rollers. Rollers of this type shall be of sturdy construction, have a low center of gravity, and be perfectly balanced on the longitudinal axis. These rollers shall have smooth operating reversing clutches and smooth operating brakes of ample capacity.

The rims of the driving and guide roll shall be machined to a true surface.

All rollers shall be equipped with sprinkling systems having storage tanks of not less than seventy (70) gallons total capacity. The water shall be piped to front and rear rolls. The spray pipe shall extend the full width of roll and shall be so installed as to be readily cleanable. The water shall be distributed from the spray pipes through fiber mats securely suspended against the rims. Separate valves shall control the flow of water to front and rear rolls. Adjustable spring scrapers shall be fitted to front and rear rolls to scrape in both directions.

The distribution of weight shall be such that not more than sixty-eight (68) percent of the total gross weight be placed upon the driving roll.

Two-axle tandem rollers shall weigh not less than eight (8) tons net operating weight and shall conform to the following:

| | |
|---|---|
| Min. diameter, driving roll, inches | 52 |
| Min. diameter, guide roll, inches | 40 |
| Min. rolling width, inches | 50 |
| Min. compression, per inch width driving roll, pounds | 184 |
| Max. rolling speed M.P.H. | 2.0 |
| Min. wheel base, inches | 120 |

(b) Three-Wheeled Rollers. Rollers of this type shall be of rigid and sturdy construction.

The rims of front and rear wheels shall be made of gray iron, semi-steel or other alloys of extreme density and toughness. The rolls shall be machined with a flat surface.

Gasoline or diesel propelled rollers shall have smooth operating friction clutches or torque converters of the reversing type and smooth operating brakes of ample capacity.

All rollers of this type shall be equipped with sprinkling systems as hereinbefore prescribed for tandem rollers and placed in such manner that not more than seventy-five (75) percent of the combined weight of tank and contents shall be distributed to the rear axle.

Front and rear rolls shall have closely fitting spring scrapers adjustable for forward and reverse motion.

The minimum compression required per inch width of rear wheels is based on the net operating weight of the roller.

The distribution of weight shall be such that not more than seventy-two (72) percent of the total gross weight be carried on the rear axle.

Three wheeled rollers shall weigh not less than ten (10) tons net operating weight and shall conform to the following:

| | |
|---|---|
| Min. diameter, drive rolls, inches | 68 |
| Min. width, drive rolls, inches | 24 |
| Min. Compression per inch, of width drive rolls, pounds | 300 |
| Min. diameter, guide roll, inches | 40 |
| Min. laps, each side guide and drive rolls, inches | 4 |
| Max. width, outside drive roll to outside drive roll inches | 85 |
| Max. rolling speed, M.P.H. | 1.5 |
| Min. wheel base, inches | 126 |

(c) Tamping (Sheepsfoot) Rollers. Rollers of this type shall consist of watertight steel drum mounted in a rigid frame. The outer surface of the drum shall be studded with rows of tamping feet firmly fused to the drum exterior. Frames on all units shall be mounted to give full oscillation and uniform ground pressure. Cleaner teeth shall be mounted on all units in such a manner that they will constantly clean the working feet of earth accumulation. The tamper feet shall be maintained to manufactured shape and dimension by replacement of feet or building up by welding.

The roller unit shall be so designed that the weight may be increased to not less than two hundred-fifty (250) pounds per square inch of bearing surface on the tamping feet in contact with the ground. The load on the tamper feet shall be determined by dividing the total weight of the roller unit by the area in square inches of surface of the tamper feet in contact with the ground. The engineer shall determine the operating weight suited to the nature of soil being compacted and the rollers shall be operated at that weight.

The right is reserved to remove any tamping roller unit from the work, if in the sole opinion of the engineer, the unit is not compacting the earth properly due to nature of the soils or mechanical deficiencies.

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A tamping roller unit shall consist of two metal rollers in rigid frames mounted as a unit in such manner that each drum may oscillate independent of the other, and in addition to the foregoing requirements shall conform to the following:

| | |
|---|---|
| Min. outside diameter of roller without feet, inches | 40 |
| Min. length of each roller drum, inches | 48 |
| Min. number of tamping feet per drum | 88 |
| Min. tamping area of each foot, sq. in. | 5.4 |
| Min. number of feet on ground | 4 |
| Min. length of foot, inches | 7 |
| Min. weight empty, pounds | 5,700 |
| Min. contact pressure, p.s.i. | 105 |

Each tamping roller unit shall be drawn by means of a suitable tractor having sufficient weight to provide the necessary traction and sufficient power under actual working conditions to pull or push the unit at a minimum speed of three (3) miles per hour.

(d) Pneumatic-tired Roller. Pneumatic-tired rollers shall consist of not less than nine (9) wheels equipped with pneumatic-tires of equal size and diameter mounted on two axles attached to a rigid frame equipped with a loading platform or body suitable for ballast loading; so that the total weight of the roller can be varied to produce an operating weight per tire of between one thousand (1000) and two thousand (2000) pounds. The tires shall have treads satisfactory to the engineer. The tires on the rear axle shall be so spaced that the entire gap between adjacent tires on the front axle will be covered by the tread of the following tires. The tires shall be uniformly inflated so that the air pressure in the several tires will not vary more than five (5) pounds per square inch.

The pneumatic-tired roller shall be drawn by a suitable type tractor or truck of adequate tractive power to pull the roller at not less than three (3) miles per hour or may be self-propelled. The roller together with its motive power shall be considered a pneumatic-tired roller unit and in addition to the above requirements shallconform to the following:

| | |
|---|---|
| Min. rolling width, inches | 60 |
| Operating weight per tire, pounds | 285-2000 |
| Min. tire size, inches | 7.50 x 15 (4 ply) |
| Inflation pressure, p.s.i. | Tire Mfg. Recommendations |
| Range of ground pressure, pounds per in. roller width | 43 - 300 |

The right is reserved to remove any pneumatic-tired roller from the work, if, in the sole opinion of the engineer , the unit is not compacting the earth properly due to the nature of the soils or mechanical deficiencies.

28.3 Method of Measurement and Basis of Payment. Self-propelled smooth wheeled power rollers, described herein, used for compaction of materials as herein set forth, shall be paid for at the contract unit price per hour for "Power Roller," which price shall be full compensation for the smooth wheeled power roller, operator, fuel, lubricants, and for all labor, materials, tools, supplies, equipment, and incidentals necessary for satisfactory operation.

For the purpose of payment the unit of measurement for tamping and pneumatic-tired roller shall be a foot-hour. A foot-hour shall be considered as a net length of one (1) linear foot of double-axle roller or tamping drum, measured along its axis, between the outer face of the tires or the drum, used for compaction of materials as herein set forth for one (1) hour.

The total number of double-axle rollers or tamping rollers used as directed by the engineer shall be paid for per foot-hour.

The foot-hours of Tamping Roller or Pneumatic-tired roller, as measured above, shall be paid for at the contract unit price bid per foot-hour for "Tamping Roller," "Pneumatic-tired Roller" or "Tamping or Pneumatic-tired Roller," as indicated in the proposal, which payment shall include motive power for its propulsion, operator, fuel, lubricants, and for all labor, materials, tools, supplies, equipment, and incidentals necessary for satisfactory operation.

The Department reserves the right to increase, or to omit all or any part of the estimated amount of rolling, and no additional compensation shall be allowed by reason of such increase or decrease.

## SECTION 30 - GRAVEL BASE COURSES

30.3 Placing. Change the 3rd paragraph to read:

Initial spreading of Type 1 and Type 2 gravel base shall be accomplished by dumping the material from hauling vehicle directly from the tail gate onto the road-bed or into approved spreading devices.

30.5 Compaction. Change the first sentence to read:

Each layer of gravel base course shall be rolled with a pneumatic-tired roller of the type prescribed in Section 28. If so ordered by the engineer the final rolling may be done with a power roller.

## SECTION 33 - PRIME COAT

Change entire Specification to Read:

33.1 Description. This item shall consist of the application of a bituminous material on a previously prepared base, subgrade, existing surface or to the first lift or course as a tack coat in advance of spreading the next course when constructing plantmixed surface in more than one course, and if orded by the engineer covering the application with sand blotter.

33.2 Materials. All materials shall conform to the requirements or Part III, Material Details. Specific reference to Part III is as follows:

| | |
|---|---|
| Water | Section 70 |
| Sand Blotter | Section 82 |
| Liquid Asphalt | Section 84 |
| Emulsified Asphalt | Section 85 |

Liquid Asphalt used as prime coat on a previously prepared base or subgrade shall be of the type shown in the Estimate of Quantities and the Proposal and shall be applied in accordance with the provisions of Section 32 and as hereinafter specified. The exact rate of application to be determined by the engineer.

Asphaltic emulsion used as a "tack coat" between the courses of plantmix surface or over an existing surface shall be of the mixing type and of the grade shown on the Estimate of Quantities and in the Proposal, and prepared for application as follows:

The emulsion, as delivered, shall be cut back with forty (40) percent water, by volume, and thoroughly mixed. To accomplish this mixing, the distributor shall be partly filled with water, and the correct proportion of emulsified asphalt shall then be added, and the remaining water to be added shall be sprayed into the tank under pressure and then thoroughly circulated within the distributor. The diluted emulsified asphalt shall be applied in accordance with the provisions of Section 32 and as hereinafter specified. The exact rate of application shall be as determined by the engineer.

33.3 Construction Methods. Immediately before applying a prime coat the area to be surfaced shall be cleaned of all loose material by means of power brooms, supplemented by hand brooming if necessary. The surface to be primed shall be thoroughly bonded and compacted, true to grade and cross-section, and free from ruts, bumps and other irregularities.

The bituminous material used for prime coat shall be uniformly heated and applied by means of equipment conforming to the requirements of Section 32. The temperature of the bituminous material at the time of application shall be not less than specified in Section 32, the exact temperature to be determined by the engineer.

The prime coat shall be allowed to penetrate and cure for a period of not less than twenty-four (24) hours. This period may be shortened by the engineer, if the nature of the base being primed and favorable conditions of weather result in proper curing before the stipulated time has elapsed.

When so ordered by the engineer, after the bituminous material has penetrated the surface, the treated area shall be covered, where necessary, with sand blotter to prevent pick up under traffic, but generally traffic shall be kept off the prime until it is sufficiently cured to accommodate it.

When the plantmix surface is spread and compacted in more than one lift or course or is placed on a previously prepared bituminous surface or base, or concrete base or surface, a dilute Emulsified Asphalt tack coat shall be applied at a uniform rate of from five-hundredths (0.05) to fifteen hundredths (0.15) gallons per square yard as ordered. The dilute Emulsified Asphalt shall be prepared and applied as prescribed above.

Suitable precautions shall be taken for the protection of the prime and tack coats against any damage during its curing period and untilthe surface course is in place.

If the road is not to be closed to traffic during construction operation, the

work shall be handled so as to cause the least possible inconvenience to traffic and the traffic safely maintained in accordance with the requirements of Section 10 and as ordered by the engineer.

No bituminous material shall be applied when the atmospheric temperature is below fifty (50) degrees F., nor during unsuitable weather.

33.4 Method of Measurement. Bituminous materials for prime coat shall be measured as specified in Section 32.

Bituminous material for tack coat diluted as prescribed above shall be measured in tons of the diluted mixture acceptably applied to the surface.

Sand blotter shall be measured in tons or cubic yards, as indicated by the unit appearing in the Estimate of Quantities and the Proposal, measured in the hauling vehicles at the point of loading, conforming to all requirements in the completed and accepted work.

33.5 Basis of Payment. Bituminous material for Prime Coat, measured as provided above, shall bepaid for at the contract unit price bid per ton for the particular type of material required.

Bituminous material for tack coat, measured as provided above, shall be paid for at the contract unit price bid per ton for the particular type of diluted and blended material required.

Sand blotter, measured as provided above, shall be paid for at the contract unit price bid per ton or cubic yard for "Sand Blotter".

The Department reserves the right to increase, or to omit all or any part of the estimated amount of sand blotter to be used, and no additional compensation shall be allowed by reason of such increase or decrease.

Payments specified above shall be full compensation for all labor, materials, tools, supplies, equipment, and doing all work involved in applying the prime coat, tack coat and sand blotter as specified, including incidentals necessary to complete the work.

## SECTION 34 - SEAL COAT

Change entire specification to read:

34.1 Description. Seal coat shall consist of an application of bituminous binder on a compacted and bonded bituminous surface and, if required, covering the application with a Sand Blotter.

34.2 Materials. The materials used shall be those prescribed for the several items which constitute the finished work and shall comply with all the requirements for such materials as set out in this specification and in Part III, "Material Details". Specific references to Part III are as follows:

| | |
|---|---|
| Sand Blotter | Section 82 |
| Liquid Asphalt | Section 84 |
| Emulsified Asphalt | Section 85 |

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34.3 Construction Methods. (a) Maintaining Traffic. Where public traffic is being routed over a surface upon which a seal coat is to be applied, the seal shall not be applied to more than one-half the width of the traveled way at a time, and the remaining half width shall be kept free of obstructions and open for use by public traffic at all times until the seal coat first applied is ready for use by traffic.

The contractor shall provide for the passage of public traffic through the work in accordance with the provisions of Section 10 of these specifications, and when ordered by the engineer, traffic shall be routed through the work under one-way control.

Bituminous binder shall not be spread later in the day than will permit the stopping of traffic control prior to darkness. Bituminous binder shall be applied to only one designated traffic lane at a time and the entire width of the lane shall be covered in one operation.

(b) Preparation of base. Immediately before applying the bituminous binder the surface to be sealed shall be thoroughly cleaned of all dirt and loose material by sweeping with power brooms supplemented by hand brooms if necessary. The process of cleaning shall continue until the metal in the surfacing is exposed and all dirt and loose material is removed from the entire width of the surfacing.

(c) Applying bituminous binder. Liquid asphalt and asphalt emulsion shall be applied at a temperature and in the manner specified under Section 32 of these specifications, for distributor application of the grade of liquid asphalt or asphalt emulsion being used.

Bituminous binder shall not be spread when weather conditions are unsuitable or when either the atmospheric or pavement temperature is below fifty (50) degrees F., when a class A-1 surface treatment is to be applied to the central portion of the pavement, the seal coat shall be applied to the shoulders at least four (4) days in advance of the application of the adjacent surface treatment requiring screenings and the seal coats shall be applied in such a manner that the joint between the two types will present a neat and uniform appearance true to the line shown on the typical cross section and as established by the engineer.

After the bituminous binder has penetrated the surface, the treated area shall be covered, where necessary, with sand blotter in sufficient quantity to absorb any excess of bituminous binder and prevent picking up by traffic.

The kind of bituminous binder and the rate of application shall be as indicated on the plans or in the special provisions.

After the surface has been opened to public traffic, any excess of bituminous binder that comes to the surface shall be immediately covered with additional sand blotter.

34.4 Method of Measurement. Quantities of liquid asphalt or asphaltic emulsion to be paid for will be determined in accordance with the procedure specified in Section 32 of these specifications.

The quantity of sand blotter to be paid for shall be the number of tons or

the number of cubic yards, measured in the hauling vehicles at point of loading, as indicated by the unit stated in proposal, conforming to all requirements in the completed and accepted work.

34.5 Basis of Payment. Bituminous binder, measured as provided above, shall be paid for at contract unit price bid per ton for the particular type of material required.

Sand blotter, measured as provided above, shall be paid for at the contract unit price bid per ton or per cubic yard for "Sand Blotter".

Payments specified above shall be full compensation for furnishing all labor, materials, tools, supplies, and equipment and doing all the work involved in applying the seal coat and all incidental work connected therewith.

The Department reserves the right to increase or omit all or any part of the estimated amount of sand blotter, and no compensation shall be allowed by reason of such increase or decrease.

## SECTION 35 - CLASS A-1 SURFACE TREATMENT

Change entire specification to read:

35.1 Description. Class A-1 surface treatment shall consist of an application of bituminous binder and cover of screenings applied on a previously compacted and bonded bituminous surface complying to the typical cross section shown on the plans and as herein specified.

35.2 Materials. The materials used shall be those prescribed for the several items which constitute the finished work and shall comply with all the requirements for such materials as set out in this specification and in Part III, "Material Details". Specific references to Part III are as follows:

| | |
|---|---|
| Screenings | Section 74 |
| Liquid Asphalt | Section 84 |
| Emulsified Asphalt | Section 85 |

35.3 Construction Methods. (a) Maintaining traffic. Where public traffic is being routed over a surface upon which a surface treatment is to be applied, the surface treatment shall not be applied to more than one-half the width of the traveled way at a time, and the remaining half width shall be kept free of obstructions and open for use by public traffic at all times until the surface treatment first applied is ready for use by traffic.

Traffic will not be allowed on the newly placed bituminous binder and screenings until, in the opinion of the engineer, the screenings and bituminous binder have sufficiently set and bonded to prevent displacement by such traffic.

When the newly completed surface treatment is open to traffic, the traffic shall be controlled by use of flagmen and a pilot car for a period of six (6) hours or for such time as deemed necessary by the engineer as follows:

A flagman shall be stationed at the beginning of each newly completed section open to traffic, to stop oncoming traffic preparatory to piloting operations and shall be kept on duty during the entire control period.

Traffic control as described above shall be moved ahead progressively as the newly completed surface is open to traffic.

The contractor shall provide for the passage of public traffic through the work in accordance with the provisions of Section 10 of these specifications and as outlined above.

(b) Preparation of Base. Immediately before applying the bituminous binder, the surface to be treated shall be thoroughly cleaned of all dirt and loose material by sweeping with power brooms supplemented by hand brooms if necessary. The process of cleaning shall continue until the surfacing is exposed and all dirt and loose material is removed from the entire width of surfacing.

(c) Applying Bituminous Binder. Liquid asphalt or emulsified asphalt shall be applied at a temperature and in the manner specified under Section 32 of these specifications, for distributor application of the type of liquid asphalt or emulsified asphalt being used.

The bituminous binder to be applied shall be liquid asphalt or emulsified asphalt of the type set forth in the estimateof quantities and the proposal. The rate of application and the amount of screenings to be spread shall be indicated on the plans or in the special provisions.

Bituminous binder shall not be spread when weather conditions are unsuitable or when either the atmospheric or pavement temperature is below fifty (50) degrees F., or when sufficient screenings are not on hand to immediately cover the bituminous binder.

When surface treatment is specified for the central portion of the roadbed and a flush seal coat for the shoulders, the flush seal coat shall be applied at least four (4) days in advance of the application of the adjacent surface treatment and the applications shall be applied in such manner that the joints between the two types will present a neat and uniform appearance true to lines shown on the typical cross section and as established by the engineer.

Bituminous binder shall be applied to only one designated traffic lane at a time and the entire width of the lane shall be covered in one operation.

When emulsified asphalt is prescribed as the binder material to be used work shall be suspended in periods of high humidity and shall not be resumed until humidity conditions are normal and weather conditions favorable.

(d) Spreading cover material. Immediately following the application of the bituminous binder, it shall be covered with screenings spread at the required rate per square yard.

Screenings shall be spread by means of a chip spreader, equipped with a mechanical device which will spread the screenings uniformly over the full width of a traffic

lane in one application and that the joint between adjacent applications of screens shall coincide with the line between designated traffic lanes.

In order to avoid building a longitudinal joint, when spreading screenings on the first width of bituminous binder no screening shall be applied within six (6) inches of the edge adjacent to the next application of bituminous binder.

Bituminous binder and screening shall not be spread over a greater distance then can be rolled and finished within one days operation. The distance over which the binder is spread in advance of placing screenings shall be as determined by the engineer.

In order to eliminate dust film, screenings will be moistened with water before being applied. In spreading the screenings, the equipment used shall be so operated that the fresh binder material will be covered before equipment wheels come upon it.

Asphaltic emulsion binders applied to the road surface shall be covered with screenings before setting or breaking of the binder occurs.

(e) Finishing. After the screenings have been spread upon the bituminous binder, any piles, ridges, or uneven distribution shall be carefully removed with flat bottom shovels, or other approved methods to insure against permanent ridges or humps in the completed surface. Additional screenings shall be spread by hand in whatever quantities required to prevent picking up by the rollers or traffic, after which the surface shall be blanket rolled.

Rolling shall follow immediately behind spreading screenings to properly imbed the screenings in the soft bituminous binder and rolling shall commence at the outer edges and proceed towards the center of each spread of bituminous binder and screenings, and shall be continued until the screenings are thoroughly set into the binder. Rollers shall be of the pneumatic-tired type and shall be heavy enough to set the screenings in the bituminous binder and shall be self propelled, non-oscillating type and shall be capable of operating forward or backward without turning around on the roadbed.

After the screenings are set in the bituminous binder, but not earlier than the day following the spreading and compaction of screening, corrugations caused by loose screenings shall be broomed over the surface by means of drag-brooms. Excessive rolling or brooming will not be permitted.

After the surface has been opened to public traffic, any excess of bituminous binder that comes to the surface shall be immediately covered with additional screenings. The completed surface shall present a uniform appearance and shall be thoroughly compacted, and free from ruts, humps, depressions, or irregularities due to an uneven distribution of bituminous binder or screenings.

35.4 Method of Measurement. Bituminous binder shall be measured as specified in Section 32.

The quantity of screenings to be paid for shall be the number of tons or the number of cubic yards, measured in hauling vehicles at point of loading as indicated

by the unit stated in the proposal, conforming to all the requirements in the completed and accepted surface treatment.

35.5 Basis of Payment. Bituminous binder measured as provided above, shall be paid for at the contract unit price per ton for the particular type of material required.

Screenings measured as provided above shall be paid for at the contract unit price bid per ton or per cubic yard for "Screenings", which price shall include moistening if required.

Payments specified above shall include full compensation for furnishing all labor, materials, tools, supplies, and equipment and doing all the work involved in applying the surface treatment as specified and all incidental work connected therewith.

## SECTION 37 - CLASS B-1 ROADMIX SURFACE

Section 37.2 Materials. Add the following:

When two or more grades of one type of bituminous material are specified on the plans or in the special provisions, the grade to be used shall be determined by the engineer immediately prior to the date that delivery of material is ordered by the contractor.

37.3 Placing Aggregate. Change to read:

When all or part of the aggregate required for the construction of the roadmix surface is to be placed, the surface of the road shall be scarified lightly to a depth just sufficient to permit elimination of irregularities and reshaping true to grade and cross section. The required amount of aggregate shall then be placed and compacted in accordance with the specification for "Gravel Surface Course", Section 31.

When the aggregate is to be treated with liquid asphalt immediately after being placed, the compaction requirement on the portion to be incorporated in the mix shall not be required.

37.5 Equipment. Add the following:

Either traveling or stationary mixing plants or other equipment of proven performance may be used by the contractor in lieu of the equipment outlined above, if advance written approval is given by the engineer, and if the contractor complies with such requirements as the engineer may consider necessary to insure results that shall be at least equal to the results that would be obtained by use of the specified equipment.

37.7 Mixing. Change to read as follows:

After the final application of liquid asphalt and the mixing specified above, the entire mass of material to be mixed shall be moved by heavy blade graders into

a windrow near the center of the road and then mixed by the assemblage of mixing units, by blading the material from side to side of the road, or by munipulations producing equivalent results until all the particles are coated with liquid asphalt and the whole mass has a uniform color. During this operation the blades shall be set as to cause a revolving motion of the mixture. The mix shall be deemed comp ete when all free liquid asphalt has been scraped from the base and the mixture is free from lumps and spots with excess liquid asphalt. If the mixture is found to contain an excess of liquid asphalt, additional untreated surfacing material shall be loo ened and incorporated into the mix, and if it is found to contain a deficiency of liquid asphalt, the necessary additional amount of liquid asphalt shall be applied in the same manner as the original applications. In either case the mixing shall be resumed and continued until the entire mass in completely mixed. Oversized rocks or stones appearing in the mix from any cause shall be removed when exposed and shall be disposed of as directed by the engineer.

If a travelling type mixer is used which does not elevate the windrowed material above and free from the roadway during the mixing operation the windrow shall be completely turned over with blade graders or other approved equipment between each successive pass of the mixing machine.

If, before the mixing process is complete, the mixture should become wet due to rain or other causes, the mixing operation shall be continued until it has dried out. The mixture shall be deemed suitably dried out when the moisture content of the mix is not more than one and one-half ($1\frac{1}{2}$) percent by weight.

Before the finished mixture is finally spread for compaction, a triangular cut shall be made with a blade grader at each edge of the base course to provide for a thickened edge of asphaltic mixture. The cut shall be approximately two (2) inches deep at the outer edge and sloped to zero, two (2) feet in towards the center. In making a cut the excavated material shall be thrown to the shoulder in a small windrow against which the mixture shall be spread.

37.9 Compacting. Change to read as follows:

During the spreading operation and after the mixture has been spread as specified, it shall be compacted by means of rollers, which operation shall begin at the edges of the course and progress towards the center parallel to the center line of the roadway, overlapping in successive passes by at least one half($\frac{1}{2}$) the width of the roller. Rolling shall continue until the surface is of uniform texture and degree of compaction and is true to grade and cross section. Pneumatic-tired-rollers weighing at least three (3) tons and so constructed as to permit the weight to be increased to seven (7) tons shall be used to compact each layer, except the top layer. The tires shall be of the same size and inflated to the same pressure and the load so distributed so as to produce uniform compaction. The upper or final layer shall be rolled with steel tired tandem or three-wheeled rollers. Should unsatisfactory areas develop during compaction they shall be corrected as directed by the engineer.

37.12 Method of Measurement. Change to read as follows:

Liquid Asphalt shall be measured as specified in Section 32, "Road Application of Liquid Asphalt."

Mixing shall be measured in miles along the center line of the roadway and no extra allowance shall be made for widened sections unless otherwise provided in the special provisions.

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Mixing of intersections and all types of approaches shall be measured in square yards. Such measurement shall include only areas outside limits of the nominal width specified for the roadway surfacing.

37.13 Basis of Payment. Change to read as follows:

Aggregate,when required shall be measured and paid for as specified for the particular type of aggregate placed.

Liquid asphalt used in the mix and measured as provided above shall be paid for at the contract unit price bid per ton for the particular type of material applied.

Mixing, measured as provided above, shall be paid for at the contract unit price bid per mile for "Roadmix".

Mixing of intersections and approaches, measured as provided above, shall be paid for at the contract unit price bid per square yard for "Roadmix Intersections". When the proposal does not include an item for "Roadmix Intersections", compensation for this work shall be considered as being included in the contract prices bid for other items of the work.

Seal coat shall be measured and paid for as specified in Section 34 "Seal Coat".

Payment specified above shall constitute full compensation for mixing and compacting the surface and for all labor, material, tools, equipment, supplies, and incidentals necessary to complete the work.

## SECTION 41 - CLASS F-2 PLANTMIX SURFACE

Change the entire Specification to read:

41.1 Description. Class F-2 Plantmix surface shall consist of a combination of mineral aggregates and bituminous material mixed at a central mixing plant, and spread and compacted in one or more courses upon a prepared and approved base course in accordance with these specifications and conforming to the lines, grades, dimensions and number of courses shown on the plans or typical sections and as directed by the engineer.

This item shall also include Class F-2 Plantmix Base when it appears in the proposal. The Plantmix Base shall consist of mineral aggregates and bituminous material mixed at a central mixing plant, and spread and compacted in widening trenches on each side of the present surface as shown on the plans.

41.2 Materials. The materials furnished and used for this construction shall be those prescribed for the several items which constitute the finished work and shall conform to the requirements for the class, type and grade of material specified.

Specific reference to Part III "Material Details" are as follows:

| | |
|---|---|
| Aggregate for Roadmix and Plantmix Bituminous Surfaces | Section 73 |
| Liquid Asphalt | Section 84 |
| Asphalt Cement | Section 86 |

Liquid Asphalt used as prime coat shall be the type and grade designated in the Estimate of Quantities and the Proposal and shall be furnished and applied in accordance with the provisions of Section 33 "Prime Coat", the exact rate of application to be determined by the engineer.

Asphaltic emulsion used to paint vertical contact surfaces shall be a mixing type and shall be furnished and applied as hereinafter specified.

Asphaltic emulsion used as a tack coat over existing surfaces to be left in place or over bituminous base course or between surface courses when placing surfacing material in more than one course, shall be of the mixing type and shall be furnished and applied in accordance with the provisions of Section 33 "Prime Coat" and as hereinafter specified.

Bituminous material to be mixed with the mineral aggregate shall be Liquid Asphalt of the type, or Asphalt Cement of the penetration grade set forth in the Estimate of Quantities and the Proposal.

41.3 Equipment. (a) General requirements for all plants. The plant shall be so designed, equipped, coordinated and operated that the weighing, proportioning and mixing will yield a uniform mixture conforming to the requirements of these specifications, and within the tolerances fixed by the engineer.

The methods used in performing the work, and all equipment, tools, machinery and other appliances used in handling materials and executing any part of the work

shall be subject to the approval of the engineer before the work is started and, wherever found unsatisfactory, shall be changed or improved to his satisfaction and so maintained in good working condition.

The name and description of the plant, factory-rated capacity of the mixer, full dimensions, openings and speed of screens shall be submitted to the engineer before starting the work.

The plant shall be maintained in good mechanical condition and any defects, which affect the proper functioning of the plant or plant units or which adversely affect the qualities of the mixture, shall be corrected immediately.

Sufficient storage space shall be provided for stockpile of aggregate. The storage area shall be maintained neat and orderly and the stockpiles readily accessible for sampling.

Storage tanks for bituminous material shall be provided and the minimum storage capacity shall be twenty-five (25) tons or six thousand (6,000) gallons.

Tanks for the storage shall be equipped with a heating system capable of heating and holding the bituminous material at the required temperature. The heating system shall be designed to heat the contents of the tank by means of steam, electricity or other approved media, but flame shall not be placed in direct contact with the heating surface of the tank.

A circulating system adequate to insure a sufficient and continuous flow of the bituminous material between the storage tanks and the mixer unit during the operating period shall be provided. All pipe lines shall be steam jacketed or insulated to prevent undue loss of heat.

The plant shall be equipped with an accurate mechanical feeder for uniformly feeding the aggregate into the drier so that a uniform temperature will be obtained. The feed shall be either apron, belt, reciprocating plate, or vibrating type, with accurate and separate adjustments for total and proportional feed. The adjustments shall be capable of being locked in any position. The total and proportional controls shall be set and locked when so directed by the engineer.

The plant shall include a drier, capable of heating the aggregates to the required dryness and temperature and of continuously agitating the aggregate during this process. The drying capacity shall be sufficient to supply the mixing unit at its operating capacity, and at the required temperature.

Screening equipment shall be designed, constructed and operated in such manner that all aggregates will be uniformly separated into the specified sizes. It shall have sufficient capacity to furnish the necessary quantity of each aggregate size, when operating at normal capacity,without undue loss of efficiency and carry-over.

Bins which serve as storage space for the screened aggregate, shall contain at least two compartments. They shall be of sufficient size to supply the rated capacity of the mixer without reducing the screen efficiency to any appreciable extent. Each compartment shall be provided with an individual outlet gate, so designed and constructed that, when closed, there will be no leakage. The gates shall cut off quickly and completely.

Bituminous material shall be accurately proportioned by weight or by volume. Measurement by volume shall be made by means of approved meters or pumps, calibrated for accuracy.

An armored thermometer, reading from two hundred (200) to four hundred fifty (450) degrees F., shall be mounted in the asphalt line near the discharge valve at the mixer unit.

Mixing plants shall be provided with an approved type of dust collector and provisions shall be made to waste the material so collected or return it uniformly to the mixer as the engineer may direct.

An accurate pyrometer, the thermocouple of which shall be inserted in the discharge chute of the drier to register the temperature of the aggregate as it leaves the drier shall be installed. The instrument shall be clearly visible to the drum fireman or head feeder.

The contractor shall provide and maintain at the plant such other accurate thermometers as may be necessary to determine temperature.

All thermometric devices shall be maintained in good working condition and subject to checking against the laboratory thermometer.

Any instrument which does not operate or register properly shall be removed and repaired or replaced.

The mixer platform shall be sufficiently rigid and of ample size to provide for safe and convenient access to the mixer and other equipment pertinent thereto.

Adequate and safe stairways to the mixer platform and guarded ladders to other plant units shall be placed at all points required for accessibility to all plant operations.

All gears, pulleys, chains, and other dangerous moving parts shall be thoroughly guarded in accordance with the best practices of safe-guarding plant operations.

Clear, ample and unobstructed passage ways shall be maintained in and around the plant and the truck loading space. Passageways, platforms, and ladders shall be kept free from oil drippings.

Truck scales shall be provided at each plant. Each truck shall be weighed empty and loaded.

All plant and truck scales and metering devices shall be inspected and sealed by the University of Nevada, Department of Weights and Measures.

The contractor shall furnish at his own expense for use in testing scales, one standard fifty (50) pound weight for each five hundred (500) pound of batch scale capacity for each individual installation.

The department reserves the right to prohibit the use of any drying, proportioning and mixing equipment which, in the opinion of the engineer, fails to dry

and proportion the aggregates properly or fails to produce a satisfactory mixture.

(b) Batch Plant Requirements. (a) Scales - Scales used to weigh the bituminous materials shall be of the beam or springless dial types. Beam scales shall be equipped with tare and full capacity beams. Dial scales shall have a capacity of not more than fifteen (15) percent of the capacity of the mixer. The value of the minimum graduation shall not be greater than two (2) pounds.

Scales for the aggregate weigh box shall be of either the beam or springless dial type, of approved design, sensitive to one half ($\frac{1}{2}$) of one (1) percent of the maximum required load. When of the beam type, there shall be a separate beam for each size of aggregate and a tare beam for balancing the hopper. The scales shall be provided with a "tell-tale" dial which will start to function when the load being applied is within one hundred (100) pounds of that desired. Sufficient vertical movement shall be provided in the beams to permit the "tell-tale" to function properly. Each beam shall have a locking device designed so that the beam can be suspended or thrown out of action.

Dial scales shall be of approved design and of such size that the numerals can be read at a distance of twenty-five (25) feet. The dials shall be of the compounding type and have full compliment of index pointer. Pointers so placed as to give excessive parallax errors shall not be used. Dial scales shall be substantially constructed, and those that easily get out of adjustment shall be removed and replaced when so ordered. All dials shall be located so as to be plainly visible to the operator at all times.

The scales shall be satisfactory to theengineer and shall be sealed, at the expense of the contractor, as often as he deems necessary to insure accuracy.

The weigh box shall be of sufficient size to hold the maximum required weight of aggregate for one batch without running over. The weigh box shall be supported on fulcrums and knife-edges so constructed that they will not be easily thrown out of alignment or adjustment. All parts of the weigh box shall be free from contact with any supporting rods, columns or other equipment which will affect the proper functioning of the hopper or scales. Sufficient clearance between the weigh box and supporting devices shall be provided to prevent accumulation of foreign materials.

The discharge gate of the weigh box shall be situated in such manner that the aggregates will not segregate when dumped into the mixer.

The bituminous material may be measured by an approved volumetric metering device, or weighed in an asphalt weigh bucket.

The weigh bucket shall be steam jacketed or electrically heated and shall have a capacity of not less than fifteen (15) percent of the maximum capacity of the mixer. It shall be supported on fulcrums and knife edges.

The batch mixer shall be of an approved twin pug mill type, steam jacketed or heated by other approved means and capable of producing uniform mixtures within the specified tolerances. It shall be equipped with a sufficient number of paddles or blades set in proper order and operated at such speed as to produce a properly and uniformily mixed batch. The clearance of the paddles or blades from all fixed and

moving parts shall not exceed one (1) inch. Badly worn or defective paddles or blades shall not be used in mixing operations. The blades or paddles shall be of a type adjustable for angular position on the shafts and reversible to retard the flow of the mix.

The mixer shall beprovided with an approved time lock which will lock the discharge gate and will not release the gate until the time specified has elapsed.

The "dry mixing time" is the interval between the opening of the weight box gate and the application of the bituminous binder.

The "wet mixing time" is the interval between the application of the bituminous binder and the opening of the discharge gate of the mixer.

Mixing time shall be set in the presence of and at the direction of the engineer who shall then lock the timing device gate. No further changes shall be made except on his instructions.

(c) Continuous-Plant Requirements. (a) Continuous mixing plants shall include a means for accurately proportioning each bin size of aggregate either by weight or volume. When gradation control is by volume, the unit shall include a feeder mounted under the compartment bins. Each bin shall have an accurately controlled individual gate to form an orifice for volumetrically measuring the material drawn from each respective bin compartment. The orifice shall be rectangular and of adequate dimensions to provide positive feed without bridging, with one (1) dimension adjustable by positive mechanical means and be provided with a lock. Indicators shall be provided to show the individual gate opening in inches.

The plant shall include a means for calibrating gate openings by weight. The materials fed out of the bins through individual orifices shall be by-passed to a suitable test box, each component material confined in a separate section. The plant shall be equipped to conveniently handle test samples weighing up to five hundred (500) pounds and accurate platform scales shall beprovided for this purpose.

The bituminous material shall be introduced into the mixer through an accurate indicating meter by a positive displacement type pump. The pump shall be equipped with ready means of varying the rate of delivery of bituminous material. An approved means of weighing the delivery of bituminous material to the mixer shall be provided in order that the accuracy of asphalt delivery from the pump may be checked at intervals determined by the engineer. Positive interlocking control shall be afforded between the flow of aggregate from the bins and the flow of bituminous binder from the pump.

The plant shall include an approved twin pugmill type mixer, steam jacketed, or heated by other approved means. The paddles shall be adjustable for angular position on the shafts and reversible to retard theflow of the mixture. The mixer shall carry a manufacturer's plate giving the net volumetric contents of the mixer at the several heights inscribed in a permanent gage. The output of the plant in tons per hour shall not exceed the manufacturers rated output.

Unless otherwise required, determination of mixing time shall be by weight method under the following formula. The weights shall be determined for the job from test made by the Department.

$$\text{Mixing time in seconds} = \frac{\text{Pugmill dead capacity in pounds}}{\text{Pugmill output in pounds per second}}$$

(d) Spreading and Compacting Equipment. Unless otherwise provided, Class F-2 Plantmix Surface shall be spread with self-propelled mechanical spreading and finishing equipment, provided with a screed or strikeoff assembly capable of distributing not less than the full width of a traffic lane. The screed shall be adjustable to the required template and elevation. The term "screeding" includes any cutting, crowding, or other action which is effective on the mixture without tearing, shoving, or gouging, and whichproduces a finished surface of even texture. The spreading and finishing machine shall be provided with rolling, tamping or other suitable compacting devices. If spreading and finishing machine leaves ridges, indentation, or other marks in the surface that cannot be eliminated by rolling, or prevented by adjustment in operation, its use shall be discontinued and other acceptable equipment shall be furnished by the contractor.

The self-propelled mechanical spreading and finishing machine shall be capable of propelling the vehicle being unloaded in a uniform manner and, if necessary the load of the haul vehicle shall be so limited that satisfactory spreading will be obtained. While being unloaded, the haul vehicle shall be firmly attached to the machine and the brakes on the haul vehicle shall not be depended upon to obtain contact between the haul vehicle and the machine.

The spreading and finishing machine shall be capable of spreading mixtures without segregation in layers of three-quarters (3/4) inch to not less than three (3) inches in thickness and have a satisfactory device to adjust the spreading to grade and confine the edges to a true line.

Rolling equipment shall consist of power rollers of the tandem type, three wheeled type and self-propelled pneumatic-tired type.

Three-wheeled rollers shall be of rigid and sturdy construction and designed especially for bituminous type construction. The rollers shall have smooth operating clutches of the reversing type and smooth operating brakes of ample capacity.

Tandem rollers shall be of rigid construction, have a low center of gravity, and be perfectly balanced on the longitudinal axis. The rollers shall have smooth operating clutches of the reversing type and smooth and efficient brakes.

All tandem rollers and three-wheeled rollers shall be equipped with sprinkling systems having water storage tanks of not less than seventy (70) gallons total capacity. The water shall be piped to the spray pipes on the rolls. The spray pipes shall extend the full width of roll and shall be so installed as to be readily cleanable. The water shall be distributed from the spray pipes through cocoa-fibre mats securely suspended against the rims. Separate valves shall control the water to each roll.

In addition to the above requirements, three-axle tandem rollers shall be so constructed that when the center or adjustable roll is locked in a position for all treads to be in one plane, it shall be held with a rigidity which will permit the following test under full load; with the weight of the roller supported on the center roll, the tread of the center roll shall not be more than one-eighth (1/8) inch above the plane tangent to the treads of the end rolls. With the weight of the roller supported on

the end rolls, the treads of the center roll shall not be more than one-quarter (1/4) inch below the plane tangent to the treads of the end rolls. The two-axle tandem roller and three-wheeled roller shall weigh not less than eight (8) tons. The three-axle tandem roller shall weigh not less than ten (10) tons.

Self-propelled pneumatic-tired rollers shall have a least nine (9) wheels equipped with pneumatic tires of equal size and diameter, with treads satisfactory to the engineer. The tires shall be of the size recommended by the tire manufacturers and the tires on the rear axle shall be so spaced that the entire gap between adjacent tires on the front axle will be covered by the tread of the following tire. The tires shall be uniformily inflated so that the air pressure in the several tires will not vary more than five (5) pounds per square inch. Self-propelled pneumatic-tired rollers shall be so constructed that the total weight of the roller can be varied to produce an operating weight per tire of between one thousand (1000) and two thousand (200) pounds, and during operation, the total operating weight of the roller shall be varied as ordered by the engineer. The rollers shall be adequately powered and have smooth operating clutches of the reversing type and smooth operating brakes of ample capacity. The rollers shall be capable of being operated both forward and backward without turning on the roadbed. The use of rollers which cause a loosening of the surface being rolled will not be permitted.

Self-propelled pneumatic-tired rollers shall be equipped with a tire wetting system for both front and rear tires. The water storage tank for the wetting system shall be not less than sixty (60) gallon capacity.

Trucks for hauling bituminous mixtures from the plant to the point of use shall have tight, clean and smooth metal beds, properly treated to prevent the mixture from adhering to the bed. Canvas covers shall be provided when ordered by the engineer to protect the mixture from the weather. Any truck causing excessive segregation of material, or that shows oil leaks in any magnitude, shall upon direstion of the engineer be removed from the work until such conditions are corrected. The contractor shall at all times provide an adequate number of trucks to haul the continuous output of the mixing plant so that the mixture in the hopper of the spreading and finishing machine will not cool below specified temperature between loads.

41.4 Field Laboratory. The contractor shall provide a building conforming to the requirements of Section 69 "Field Laboratory". It shall be located so that the mixing platform is in full view from one of the windows. This Field Laboratory shall be for the exclusive use of the Department's representatives.

41.5 Preparation of Mixtures. Fine material or filler, if required to meet specified grading, shall be blended with the aggregate before screening into the separate compartments.

Aggregates shall be cleanly separated into at least two sizes and stored in separate bins ready for proportioning and mixing.

If a bin contains fifteen (15) percent or more material which is undersize for that bin, the bin shall be drawn down and the material rescreened.

At the time of mixing, the mineral aggregate shall not have an average moisture content in excess of one (1) percent. In certain special cases when the aggregate

is unusually porous, a moisture content in excess of the above limit will be permitted, at the discretion of the engineer, when laboratory tests indicate that such increased moisture content will not produce an unsatisfactory mixture. At the completion of mixing operation the amount of moisture in the mixture shall not exceed the limit above specified.

The temperature of the mineral aggregate at the time of adding the bituminous material, shall not be in excess of the following:

| | | |
|---|---|---|
| Liquid Asph. | SC-4 | 250° F. max. |
| | SC-5 | 275° F. max. |
| | SC-6 | 300° F. max. |
| | Asphalt Cement | 325° F. max. |

Liquid asphalt used as bituminous material shall be added to the aggregate at a temperature conforming to the range of temperatures as follows:

| | |
|---|---|
| SC-4 | 250° min. - 325° F. max. |
| SC-5 | 250° min. - 350° F. max. |
| SC-6 | 275° min. - 350° F. max. |

Asphalt cements used as bituminous binder shall be added to the aggregate at a temperature of not less than 275° F., nor more than 400° F., the exact temperature to be designated by the engineer.

The exact proportions of mineral aggregate and bituminous material, within the limits specified, shall be regulated as directed by the engineer to produce a mixture with all the particles of mineral aggregate coated with bituminous material. The amount of bituminous material to be added to the mineral aggregate shall be between three (3) and seven (7) percent. The exact amount of bituminous material to be added to the mineral aggregate will be determined by the engineer at the time of mixing. When a greater amount of bituminous material is required to produce a satisfactory mixture, due to the porosity of the aggregate, the amount of bituminous material to be added to the aggregate shall be increased, above the limits specified, as ordered by the engineer.

When the mixture is produced in a batch plant, the component materials shall be accurately weighed within plus or minus two (2) percent of the total batch weight. The two or more sizes of aggregate shall be combined in uniform batches by weighing and conveyed to the mixer through a discharge gate on the weigh box that is so arranged as to blend the different sizes of aggregates as they enter the mixer. A weigh box that permits separation of sizes of aggregate in the ends of the mixer will not be permitted. The bituminous material shall be introduced into the mixer, by gravity distribution along the center of the mixer parallel to the mixer shafts, by means of a distributing pan fixed on the side of the mixer, or by pressure spraying. The pan shall be equipped with movable vanes in order that the flow of bituminous material may be directed across the width of the pan as desired. The vanes shall be equipped with a means of quick adjustment and a positive lock to prevent shifting. After the bituminous material is introduced into the mixer, mixing shall continue until a homogeneous mixture of uniformly distributed and thoroughly coated aggregates of unchanging appearance is produced. The "wet mixing time" shall not be less than thirty (30) seconds.

When the mixture is produced in a continuous mixing plant, the delivery of aggregates to the mill will be as hereinbefore set forth and at such rate that the composition of the finished mixture shall conform to these specifications and the established

tolerances. The volume per unit of time shall be determined by weight at least once each day and as often thereafter as may be necessary to secure the desired uniformity. The aggregates shall be combined with the required quantity of bituminous binder as the materials enter the mixer. The rate of feed to the mixer shall be such that the combination of bituminous binder and aggregate shall be mixed for at least thirty (30) seconds, or as much longer as may be necessary to secure a homogeneous mixture of uniformly distributed and thoroughly coated aggregate of unchanging appearance.

41.6 Placing. Bituminous mixture shall be placed only on bases that are dry, when weather conditions are suitable and the atmospheric temperature is above fifty (50) degrees F.

The base course shall be cleaned of all loose and foreign materials, primed, when required, and the contact surfaces of all curbing, gutters andother structures projecting into or abutting the pavement uniformly painted with a thin coating of asphaltic emulsion at the rate of from two hundredths (0.02) to one tenth (0.10) gallon per square yard of surface covered, the exact rate of application shall be determined by the engineer. The asphaltic emulsion shall be applied only as far in advance of surfacing as ordered by the engineer.

Unless otherwise specified, or specifically excepted, the base upon which bituminous mixture is to be placed shall receive a prime treatment conforming to the requirements of Section 33, at the rateor rates shown on the plans, the exact rate of application shall be determined by the engineer.

Prime coat shall not be applied until all subgrade preparations are complete, and only so far in advance of placing the bituminous mixture as the engineer may direct. After the bituminous material for Prime Coat has penetrated the surface, and if ordered by the engineer, the primed areas shall be covered with a sand blotter and spread in a quantity ordered by him.

Immediately in advance of placing the surfacing material, additional prime coat shall be applied, as directed by the engineer, to areas where the prime coat has been destroyed.

The bituminous mixture shall be delivered on the roadbed at a temperature of not less than two hundred twenty-five (225) degrees F. Higher temperatures are required when paving grade asphalts are used, but in no case shall the mixtures be delivered on the roadbed in excess of three hundred twenty-five (325) degrees F. The proper temperature within the above limits shall be as ordered by the engineer.

Tarpaulins shall be furnished by and at the expense of the contractor, andused to cover all loads during transportation, if ordered by the engineer.

The bituminous mixture shall be spread and compacted in one or more courses as indicated on the plans. Unless otherwise indicated on the plans or in the Special Provisions, when the compacted thickness is three (3) inches or more the surfacing shall be spread and compacted in two lifts of equal thickness.

All courses shall be spread by means of a self-propelled mechanical spreading and finishing machine.

There shall be operating with each spreader at least one (1) two-axle tandem

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or three-wheeled roller, one (1) self-propelled pneumatic-tired roller and one (1) three-axle tandem roller.

After the prime coat has been applied the first course shall be spread to proper width and to such depth as will compact to the required thickness.

After spreading and as soon as the mixture will bear the weight of the roller without undue distortion, the course shall be uniformly compressed by an approved three-wheeled roller or two-axle tandem roller. This initial compaction shall consist of two complete coverages. Immediately following the breakdown rolling and while the mix is quite hot additional density shall be obtained with a self-propelled pneumatic-tired roller weighing not less than five (5) tons. This rolling shall consist of at least eight complete coverages. Final rolling shall be performed with a three-axle tandem roller and shall continue until the layer is smooth, free from ruts, humps and irregularities and true to grade and cross section.

All rolling shall start longitudinally at the edge of the course and proceed toward the center of the pavement, overlapping on successive trips, approximately twelve (12) inches. On superelevated curves it shall progress from the lower side to the high side overlapping as above specified. The speed of the rollers shall be slow enough to avoid displacement of the hot material and rolling shallbe a continuous process, so far as practicable. All parts of the mixture shall receive equal compaction. To prevent adhesion of the mixture to the rollers, the wheels shall be kept moistened but an excess of water will not be permitted. Any material which is marred or displaced by the rolling operations shall be corrected with rakes and the addition of fresh material.

When rolling adjacent lanes the rollers shall compress the joint by operating on the cold lane, lapping from six (6) to twelve (12) inches over the hot material and following immediately after spreading.

Construction of one course or lift upon another shall not proceed until the first of the two courses or lifts has completely cooled and set.

Before a second lift or course is laid on the course previously completed, the previously laid course shall be clean and free of all mud, earth, dust and other foreign materials. The contractor shall furnish all equipment required for thoroughly cleaning the surface to be "tacked" or paved. The equipment shall consist of one or more mechanical sweepers of an approved type and also any scrapers, shovels and hand brooms deemed necessary.

A tack coat of asphaltic emulsion shall be applied to the first course in advance of spreading the next course as specified in Section 33.

Each course shall be spread, compacted, and finished as above set forth.

Longitudinal and transverse joints in each course or lift shall be well bonded and made in a careful manner. If so directed by the engineer, joints, including those adjacent to existing construction, shall be painted with asphaltic emulsion. Longitudinal joints shall be spaced in such a manner that joints in succeeding courses will be at least three (3) inches horizontally from joints in any preceeding course. The longitudinal joint in the final course shall be within three (3) inches of the center line of the finished surface.

During paving operations, the contractor,at his own expense, shall provide satisfactory planking to protect the longitudinal edges of the newly placed course from damage by his equipment.

When it is necessary to carry public traffic through the paving operations the first course or lift shall be constructed over the entire project before the second course or lift is laid, except when it is necessary to set up the plant at more than one location. The project shall be divided into increments of lengths determined by the engineer to best facilitate the handling of traffic. Traffic shall be kept off the surfacing area of each section during priming, placing, tacking and compacting operations and during the curing periods. During such operations traffic shall be maintained along one-half width of the roadbed. Warning signs, flares, flagmen and such other items shall be provided as set forth in Section 10, in addition, in order to minimize damage to the longitudinal joint adjacent to traffic, the contractor shall provide and place "traffic cones" to outline the edge of the newly placed surfacing. The "Traffic cones" shall be painted a bright traffic yellow and suitably reflectorized, and shall be spaced approximately one hundred (100) feet apart. After dark, every fourth "cone" shall be provided with a flare set adjacent or on the "cone".

41.7 Plantmix Base Course. All of the foregoing articles shall apply to the plantmix base where applicable.

The plantmix base shall be spread with a spreader devised for distributing the bituminous mixture in the widening trench. The spreader shall be of a type manufactured by the All Purpose Spreader Company or an approved equal.

The base may be laid in one course and when compacted shall be no lower than the elevation of the existing bituminous surface and shall not exceed one-half ($\frac{1}{2}$) inch above that elevation. The degree of compaction shall be equal to the compaction obtained for Plantmix Surface. Pneumatic-tired equipment shall not be used for compaction unless it is specifically designed for compaction purposes.

41.8 Miscellaneous Areas to be Surfaced. Surfacing of intersecting roads, approaches, street intersection areas, truck parking areas, frontage roads, sidewalk areas, median strip areas, and island areas shall conform to all the requirements hereinbefore specified except at locations where the bituminous material is to be placed over areas inaccessible to the required spreading and compacting equipment or over areas where the use of required spreading and compacting equipment would be impractical, the mixed material may be spread and compacted in one course by other methods approved by the engineer.

Bituminous mixture used in the construction of shoulder dikes; placed around embankment protector assemblies; placed as ditch lining, except roadway ditches; and placed over other areas designated by the engineer, shall contain approximately fifty (50) percent more bituminous material than used in the mix placed on the surface of the roadbed. The exact amount of additional bituminous material shall be as ordered by the engineer and the bituminous mixture may be spread by hand or other approved methods in one course. After spreading, the material shall be thoroughly compacted to the required lines, grades and cross-section by means of pneumatic tampers, or by other methods approved by the engineer, that will produce the same degree of compaction as that obtained by pneumatic tampers, except that shoulder dikes shall be placed with approved equipment capable of shaping and thoroughly compacting the material to the required cross-section.

41.9 Surface Treatments. After the surface has been opened for use by public traffic for a period of time sufficient, in the opinion of the engineer, to have thoroughly compacted the entire surface, a surface treatment shall be applied to the traffic lanes as shown on the plans, this surface treatment shall be furnished and applied in accordance with the provisions of Section 35.

Plantmix paved ditches shall be given a seal coat furnished and applied in accordance with Section 34.

When indicated on the plans or set forth in the Special Provisions, plantmix surface placed outside the area designated to receive Class A1 surface treatment shall be given a seal coat furnished and applied in accordance with Section 34.

41.10 Method of Measurement. Bituminous materials used in the mix either for surface or base shall be measured as specified in Section 32.

The quantity of plantmix surface or plantmix base to be paid for shall be the number of tons, conforming to all the requirements, in the completed and accepted work, less the weight of the bituminous material.

The quantity of shoulder dikes constructed of plantmix material, the placing of which is to be paid for as a contract item on a linear foot basis, will be determined from measurements taken along the top of the completed dikes to the nearest one (1) foot length. The quantities of plantmix surface used to construct the dikes shall be measured as set forth above.

The quantities of plantmix material, the placing of which is to be paid for as a contract item on an area basis in addition to the contract prices paid for the plantmixed material will be determined from measurements of the plantmix material compacted in place.

41.10 Basis of Payment. The bituminous material used in the mix, either for surface or base, measured as provided above, shall be paid for at the contract unit price bid per ton for "Liquid Asphalt, Type____" or "Asphalt Cement_____Penetration", as the case may be.

The quantity of surfacing placed on the roadbed, approaches, intersection areas, frontage roads, sidewalk areas, median areas, truck parking areas, and island areas, measured as provided above, will be paid for at the contract unit price bid per ton for "Class F-2 Plantmix Surface" which payment shall be full compensation for furnishing all labor, materials, tools, supplies and for doing all work involved in placing the plantmix surface as above specified, including any necessary hand placing and compacting of surfacing material around drop inlets, manholes, embankment protectors, guard rail posts and other minor structures.

The quantity of plantmix base placed in the widening trenches, measured as provided above, will be paid for at the contract unit price bid per ton for "Class F-2 Plantmix Base", which payment shall be full compensation for furnishing all labor, materials, tools, supplies and for doing all work involved in placing and compacting the plantmix base as above specified.

The quantity of plantmix surfacing used to construct ditch linings will be paid for at the contract unit prices bid for surfacing placed on the roadbed as above specified.

Placing the plantmix surfacing material in the ditch will be paid for at the contract unit price bid per square yard for "Plantmix Paved Ditches", which payments shall be full compensation for preparing the ditch subgrade, hauling, spreading and compacting the plantmixed material and for all labor, materials, tools, supplies, equipment and incidentals necessary to complete the work.

The placing of plantmix material for shoulder dikes, measured as provided above, will be paid for at the contract unit price bid per linear foot for "Plantmix Shoulder Dike" and the quantity of plantmix surfacing used to construct the shoulder dike shall be measured and paid for as prescribed for plantmixed material placed on the roadbed, which payments shall be full compensation for furnishing all labor, materials, tools, supplies and equipment and for doing all work involved in placing and compacting the plantmixed material complete in place as specified.

Prime Coat and Tack Coat shall be measured and paid for as specified in Section 33.

Seal Coat for plantmix paved ditches and other areas specified to receive a Seal Coat shall be measured and paid for as specified in Section 34.

Surface Treatment shall be measured and paid for as specified in Section 35.

Sand Blotter shall be measured and paid for as specified in Section 33.

Asphaltic emulsion for use as a paint and the cost of application, shall not be measured and paid for directly, but shall be considered a necessary part of the construction involved, and payment shall be considered as included in prices bid for other items of the work.

## SECTION 45 - CONCRETE STRUCTURES

45.1 Description. Change to read as follows:

This item shall consist of furnishing and placing Portland Cement Concrete in bridges, culverts, headwalls, retaining walls, slope pavements, and all other types of concrete structures. The concrete shall be composed of Portland Cement, fine aggregate, coarse aggregate, and water, proportioned and mixed as specified herein. The masonry shall be of a class and shall conform to the shapes and dimensions shown on the plans or ordered in writing by the engineer.

45.2 Materials. Change to read as follows:

The materials used shall be those prescribed for the several items which constitute the various mixtures and shall conform in all respects with the requirements for such materials as set out in Part III "Material Details". Specific references to Part III are as follows:

| | |
|---|---|
| Water | Section 70 |
| Coarse Aggregate for Portland Cement Concrete | Section 76 |
| Fine Aggregate for Portland Cement Concrete | Section 81 |
| Portland Cement | Section 89 |
| Asphalt for Waterproofing | Section 88 |
| Sheet Copper | Section 91 |
| Expansion Joint Filler | Section 105 |

When air-entrained concrete is specified, evidence based on tests made in a recognized laboratory shall be submitted to show that the air-entraining admixture the contractor elects to use conforms to the requirements of the latest revision of AASHO M 154 (ASTM C 260) for 7- and 28-day compressive and flexural strengths and resistance to freezing and thawing, except as provided in the following paragraph. Tests for bleeding, bond strength and volume change will not be required. A "recognized" laboratory is any State highway, Bureau of Public Roads or cement and concrete laboratory regularly inspected by the Cement Reference Laboratory of the National Bureau of Standards. Tests may be made upon samples taken from a quantity submitted by the contractor for use on the project or upon samples submitted and certified by the manufacturer as representative of the admixture to be supplied.

An exception to the requirements in the preceding paragraph is the case of admixtures which are manufactured by neutralizing Vinsol resin with caustic soda (sodium hydroxide). When the contractor proposes to use such an admixture he shall submit a certification concerning the admixture in the following form.

> "This is to certify that the product (trade name) as manufactured and sold by the (company) is an aqueous solution of Vinsol resin that has been neutralized with sodium hydroxide. The ratio of sodium hydroxide to Vinsol resin is one part of sodium hydroxide to (number) parts of Vinsol resin. The percentage of solids based on the residue dried at 105° C. is (number). No other additive or chemical agent is present in this solution."

When the contractor proposes to use an air-entraining admixture which has been previously approved, he shall submit a certification stating that the admixture is the same as that previously approved. If an admixture offered for use is essentially the same (with only minor differences in concentration) as another previously approved material, a certification will be required stating that the product is essentially the same as the approved admixture and that no other admixture or chemical agent is present.

Either prior to or at any time during construction the engineer may require that tha admixture selected by the contractor be further tested to determined its effect upon the strength of the concrete. When so tested, 7-day compressive strength of concrete made with the cement and aggregates in the proportions to be used in the work and containing the admixture under test in an amount sufficient to produce from 3 to 6 percent entrained air in the plastic concrete shall be not less than 88 percent of the strength of concrete made with the same materials and with the same cement content and consistency but without the admixture.

The percentage reduction in strength shall be calculated from the average strength of at least 5 standard 6" x 12" cylinders of each type of concrete. Specimens shall be made and cured in the laboratory in accordance with the requirements of the latest revision of AASHO T 126 (ASTM C 192) and shall be tested in accordance with the requirements of the latest revision of AASHO T 22 (ASTM C 39). The percentage of entrained air shall be determined in accordance with the requirements of the latest revision of AASHO T 152 (ASTM C 231).

Admixtures failing to meet the above requirements may be rejected.

45.3 Classification. Change to read as follows:

Concrete shall be of eight (8) classes: Class A, Class B, Class C, and Class D, for concrete without air-entraining, and Class AA, Class BA, Class CA, and Class DA for concrete with air-entraining. Each class of concrete shall be used in that part of the structure in which it is called for on the plans or where directed by the engineer. The following requirements shall govern unless otherwise prescribed in the special provisions or shown on the plans.

Class A or Class AA shall be used for reinforced substructures, retaining walls, slope pavement and superstructures.

Class B, or BA shall be used for massive substructures, gravity walls and backfill with little or no reinforcing.

Class C or CA shall be used for backfill and very massive unreinforced sections.

Class D or DA shall be used for parts of superstructures an substructures where a small aggregate is required.

The following sizes of coarse aggregate shall be used for the various classes of concrete previously designated.

Class A and Class AA - - - - - - - - - - - No. 4 to 1 $\frac{1}{2}$ inch
Class B and Class BA - - - - - - - - - - - No. 4 to 2 $\frac{1}{2}$ inch
Class C and Class CA - - - - - - - - - - - No. 4 to 3 inch
Class D and Class DA - - - - - - - - - - - No. 4 to 3/4 inch

45.6 Equipment. Change to read as follows:

Methods employed in performing the work, and all equipment, tools, and machinery used for handling materials and executing any part of the work, shall be subject to the approval of the engineer. All equipment necessary shall be on hand and approved before concrete operations are begun by the contractor.

Weighing equipment for aggregates shall be accurate within an allowable error of not more than five-tenths (5/10) of one (1) percent of all loads. It shall be arranged so as to allow compensation to be made for changes in weight of moisture contained in the aggregates, and to permit the convenient removal of overweight material from the weighing hopper. The scales shall be either of the beam or springless dial type. A suitable device consisting of a graduated beam or dial shall be used to register at least the last 100 pounds of either of the aggregates required for the batch. The value of the minimum graduation shall not be greater than two (2) pounds.

Water measuring equipment shall be capable of accurate measurement with an allowable error of not more than two (2) percent and shall be so arranged that the accuracy of measurement shall not be affected by variations in pressure in the water supply line. The water measuring equipment shall preferably include an auxiliary tank from which the measuring tank shall be filled.

Portland cement concrete shall be mixed in batch mixers of an approved design, which may be either of the revolving drum or pug mill type. The mixer shall be equipped with an approved timing device which will automatically lock the discharging device so as to prevent the emptying of the mixer until the materials have been mixed the minimum specified time.

Transit type mixers may be used when approved by the engineer. Approval will be given if investigation of the plant and delivery system indicates that concrete delivered to the site of the project will conform in all respects with the requirements of the specifications.

The mixer shall be a closed, water tight, revolving drum. It shall be suitably mounted and shall be fitted with blades capable of combining all ingredients into a thoroughly mixed and uniform mass, and of discharging the concrete without segregation.

Mixers shall be examined daily for changes in condition due to accumulation of hardened concrete or mortar or to wear of blades. When any such change of condition is found, the faulty equipment shall be corrected before its further use is allowed.

The mixing speed of the drum shall be not less the four (4) nor more than fifteen (15) revolutions per minute. The agitating speed of the drum shall be not less than two (2) nor more than six (6) revolutions per minute.

Each truck shall be equipped with an approved device for registering the number of revolutions made by the drum during the interval between introduction of water into the drum and discharge of the concrete from the mixer. The drum shall revolve continuously during this interval.

Each mixer shall have attached thereto in a prominent place a metal plate or plates on which is plainly marked the various uses for which the equipment is designed, the capacity of the drum, or container, in terms of the volume of the mixed concrete and the speed of rotation of the mixing drum or blades.

The truck mixers shall have a water measuring device to measure accurately the quantity of water for each batch. The device shall be mounted on the truck mixer or located at the point of taking on the water. The device shall permit ready access and ready determination of the amount of water used.

45.8 Forms Change the 6th paragraph to read as follows:

Forms shall be filleted at all sharp corners. Triangular molding used for fillets shall have two (2) equal sides. In general, the width of the equal sides of moldings shall be three-fourths (3/4) inch; for massive work, such as heavy pier copings and colums, the width shall be one and one-half ($1\frac{1}{2}$) to two (2) inches. Top edges of walls, curbs and slabs shall be rounded with an edging tool to a radius of one-half ($\frac{1}{2}$) to three-fourths (3/4) inch. All edges of concrete rails and rail posts to be rounded to a radius of one-eighth (1/8) to one-quarter ($\frac{1}{4}$) inch.

45.9 Proportioning. Change the table to read as follows:

| Class | Coarse Aggregate Used | Weight of Fine Aggregate Per Bag of Cement — Minimum Pounds | Maximum Pounds | Total Weight Aggregate Per Bag of Cement |
|---|---|---|---|---|
| A | * Rounded | 190 | 225 | 570 |
| A | * Angular | 195 | 225 | 510 |
| AA | * Rounded | 175 | 210 | 540 |
| AA | * Angular | 180 | 210 | 480 |
| B | * Rounded | 210 | 250 | 730 |
| B | * Angular | 220 | 250 | 640 |
| BA | * Rounded | 200 | 235 | 700 |
| BA | * Angular | 205 | 235 | 610 |
| C | * Rounded | 280 | 320 | 900 |
| C | * Angular | 295 | 320 | 800 |

Weight of Fine Aggregate (Cont.)

| Class | Coarse Aggregate Used | Per Bag of Cement — Minimum Pounds | Maximum Pounds | Total Weight Aggregate Per Bag of Cement |
|---|---|---|---|---|
| CA | * Rounded | 260 | 300 | 820 |
| CA | * Angular | 280 | 315 | 770 |
| D | * Rounded | 230 | 250 | 530 |
| D | * Angular | 230 | 250 | 480 |
| DA | * Rounded | 200 | 225 | 480 |
| DA | * Angular | 200 | 225 | 430 |

* When coarse aggregate contains some rounded and some angular particles an interpolation shall be made between the amounts shown.

45.11 Consistency. Change table to read as follows:

| | |
|---|---|
| Class A and Class AA | 2 to 4 inches |
| Class B and Class BA | 1 to 3 inches |
| Class C and Class CA | 1 to 3 inches |
| Class D and Class DA | 2 to 4 inches |

45.12 Mixing. Change to read as follows:

Unless otherwise authorized, concrete shall be machine mixed at the site. Concrete shall be thoroughly mixed in a batch mixer of an approved size and type. It shall be mixed only in such quantities as are required for immediate use, and any which has developed an initial set, or which is not in place in the forms within 30 minutes after the water has been added, shall not be used. No retempering of the concrete shall be allowed. Concrete shall be thoroughly mixed for a period of not less than one and one-quarter minutes after all materials, including water, are in the mixer. During such period, the mixer shall be operated at speeds specified by the manufacturer. The entire contents of the mixer shall be removed before materials for the succeeding batch are placed therein. Concrete mixed in transit mixing equipment shall be agitated continuously after mixing starts until it is all discharged from the drum.

The volume of mixed concrete permitted in the drum shall not exceed the manufacturer's rating on the capacity plate; nor 50 percent of the gross volume of the drum in the case of top-door loading truck mixers; nor 57-1/2 percent in the case of end loading truck mixers.

When wash water is used as a portion of the mixing water for the succeeding batch it shall be accurately measured and taken into account in determining the amount of additional mixing water required. When wash water is carried on the truck mixer, it shall be carried in a compartment separate from that used for carrying or measuring the mixing water.

When water, cement and aggregate are introduced into a truck mixer drum at the loading plant the drum shall revolve without interruption until the concrete is discharged therefrom. Mixing shall commence immediately after the introduction of water and shall continue for at least fifty (50) revolutions of the drum at mixing

speed. Not more than one hundred fifty (150) revolutions of the drum shall be of a speed in excess of the drum's agitating speed. Any other revolutions shall be at agitating speed.

The interval between introduction of water into the drum and the final discharge of concrete from the truck mixer shall not exceed one (1) hour.

The interval between charging of the mixer drum with cement and aggregates and the introduction of water shall not exceed one (1) hour, when water is introduced in transit.

When water is to be introduced to the truck mixer drum at the site of the concrete construction the requirements above shall govern.

The organization supplying concrete shall have sufficient plant capacity and transporting apparatus to insure continuous delivery at the rate required. The rate of delivery of concrete shall be such as to provide for the proper handling, placing and finishing of the conrete. The rate shall be such that the interval between batches shall not exceed thirty (30) minutes. The methods of delivery and handling of concrete shall be such as will facilitate placing with a minimum of rehandling and without damage to the structure or the concrete.

Concrete may be partially mixed by central plant mixing for the purpose of shrinking the batch and the mixing completed by truck mixing.

Each load of ready-mixed concrete shall be accompanied by a delivery ticket completely filled out by an authorized representative of the Department. Upon arrival at the job the driver shall present one copy of the delivery ticket to the engineer or inspector.

The central plant mixing shall be in accordance with the requirements of these Specifications.

45.14 Handling and Placing Concrete. Change the 4th paragraph to read as follows:

All concrete shall be compacted by means of high frequency internal vibrators of a type approved by the engineer, with the exception that pipe culvert headwalls, curb and gutter, sidewalk, slope pavement, and related minor structures may be compacted by hand methods. The minimum frequency of the vibrators shall be not less than four thousand five hundred (4,500) impulses per minute. The intensity of vibration shall be such as to visibly affect a mass of concrete of one (1) inch slump over a radius of at least eighteen (18) inches. The number of vibrators employed shall be ample, as determined by the engineer, to consolidate the incoming concrete to the proper degree within fifteen (15) minutes after it is deposited in the forms. Vibrators shall be manipulated so as to thoroughly work the concrete around the reinfocement and into corners and angles of the forms. Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. Vibrators shall be inserted and drawn out of concrete slowly. The vibration shall be of such duration and intensity to thoroughly compact the concrete, but shall not be continued so as to cause segregation. Vibration shall be supplemented by such spading as is necessary to insure smooth surfaces and dense concrete along the form surfaces and in corners and locations impossible to reach with a vibrator.

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45.17 Cold Weather Operations. Change to read as follows:

No concrete shall be mixed or placed when the atmospheric temperature is below forty degrees F. (40° F.) without written permission of the engineer, and then only when adequate means are employed to heat the aggregate and water and protect the concrete from freezing after being placed.

Before concrete is placed in any form or around any reinforcement or on any surface, all ice, snow and frost shall be completely removed and the temperature of all surfaces in contact with the concrete raised above the freezing point. No concrete shall be placed on a frozen subgrade or on one that contains frozen materials.

Arrangements for covering or housing the newly placed concrete shall be made in advance of placement and shall be adequate to maintain in all parts of the concrete the temperature and moisture conditions specified below. When air temperatures do not fall below thirty degrees F. (30° F.) artificial heat will not be required if the concrete surface is covered with forms or with canvas arranged so that air space is maintained between the canvas and the concrete. For lower temperatures, sufficient, well distributed, artificial heat shall be provided inside the coverings or enclosures around the concrete to maintain an air temperature of forty degrees F. (40° F.) or above at the coldest point without exceeding eighty degrees F. (80° F.) at the hottest point.

Housings may be of wood, Sheetrock, Celotex, canvas, tarred paper, plywood, or other suitable materials as long as they are reasonably tight and safe from wind and snow loadings. Housings and enclosures shall be built with fire resistant materials as far as practicable. Adequate fire fighting apparatus shall be furnished in easily accessible locations wherever enclosures are constructed. Attendants shall be maintained on the job at all times to provide continuous operation of the heating units.

Housing and enclosures shall be left in place for the entire curing period specified below, or as directed by the engineer, except that sections may be temporarily removed as required to permit placing additional forms or concrete, provided they are replaced as soon as the form or concrete is in its final position.

At the end of the curing period, artificial heating shall be discontinued and housing removed in such manner that the fall in temperature at any point in the concrete will not exceed twenty degrees F. (20° F.) in twenty four (24) hours.

Newly placed concrete shall be kept at a temperature of not less than fifty degrees F. (50° F.) for seven (7) days or not less than seventy degrees F. (70° F.) for three (3) days and then maintained at a temperature of at least forty degrees F. (40° F.) for the next four (4) days. The temperature of the hardened concrete surface shall not be permitted to exceed one hundred degrees F. (100° F.) at any time during the curing period. The methods of construction and curing shall be such that the loss of moisture from the concrete is not excessive during the curing period.

For air temperatures not lower than thirty degrees F. (30° F.) the mixing water shall be heated to bring the temperature of the concrete at the mixer to between fifty degrees F. (50° F.) and eighty degrees F. (80° F.).

For air temperatures of between thirty degrees F. (30° F.) to zero degrees F. (0°F.) both the water and the fine aggregate shall be heated to bring the temperature of the concrete at the mixer to between fifty degrees F. (50° F.) and ninety degrees F. (90°F.). Only coarse aggregate that is free from frozen lumps shall be used.

For air temperature below zero degrees F. (0° F.) the water, the fine aggregate and the coarse aggregate shall all be heated to eliminate frost and to bring the temperature of the concrete at the mixer to between fifty degrees F. (50° F.) and ninety degrees F. (90° F.).

Mixing water shall be heated under such control and in sufficient quantities so that appreciable temperature fluctuations from batch to batch are avoided. To avoid flash set where either aggregate or water is heated to a temperature in excess of one hundred degrees F. (100° F.) the loading of the mixture shall be in such sequence that the cement does not come in contact with such hot materials.

Aggregates shall be heated in a manner such that frozen lumps, ice and snow are eliminated and over heating and excessive drying is avoided. At no point shallthe aggregate temperature exceed two hundred and twelve degrees F. (212° F.) and the average temperature of an individual batch of aggregate shall not exceed one hundred and fifty degrees F. (150° F.). The use of steam coils is recommended for heating aggregate.

When aggregate in stockpile, cars or trucks, are thawed or heated by means of steam coils, the exposed surface shall be covered with tarpaulins as much as practicable to maintain a uniform distribution of heat and prevent formation of frozen crust.

A permanent temperature record shall be kept, showing the date, hour, outside air temperature, and temperatues at several points within the enclosure and at the concrete surface to show the highest and lowest temperatures of the concrete surface. The use of thermometers imbedded in the concrete surface is suggested. Thermometer readings shall be taken at the start of work in the morning and again in the late afternoon. The data so obtained shall be recorded in such manner that the location of each reading and any conditions which might have an effect on the temperature will be shown. A copy of the temperature records shall be provided the engineer for reference.

The contractor shall assume all risk in the placing of concrete in cold weather, and permission given to place concrete under the above conditions shall in no way relieve the contractor of responsibility for proper results. Should concrete placed under such conditions prove unsatisfactory, it shall be removed and replaced at the contractor's expense.

45.18 Curing. Change to read as follows:

Freshly poured concrete shall be kept continuously wet for a period of not less than seven (7) days by covering with heavy absorbent mats or wet earth, by ponding, by continuous sprinkling, or by means of an approved impervious membrane. If Type III cement is used, the curing period may be reduced as directed by the engineer. When absorbent mats are used, they shall be wet sufficiently to keep the surface adjacent to the concrete surface moist at all times. After the period of water curing, concrete surfaces shall be protected from the direct rays of the sun for an additional three days. During this time the surfaces may be allowed to dry out slowly. In no

case shall alternate wetting and drying of the concrete be permitted. In cold weather the period of curing shall be extended as directed by the engineer.

Absorbent mats for curing concrete shall consist of two layers of fabric with a cotton bat filler. The fabric shall be of a quality and texture to readily permit absorption of water by the bat. The cotton bat shall be made of raw cotton, cotton comber waste, cotton card strip waste, or other approved material, and shall weigh not less than twelve (12) ounces per square yard. The mat shall be tufted or quilted to insure an even distribution of the bats within the fabric layers.

The membrane shall consist of a practically colorless impervious liquid of a type approved by the engineer. Any membrane material which would alter the natural color of the structure will not be permitted.

The liquid shall be applied under pressure with a spray nozzle in such a manner as to cover the entire surface to be cured with a uniform film, and shall be of such character that it will harden within thirty (30) minutes after application. The amount of liquid applied shall be ample to seal the surface thoroughly. Application of the liquid shall be made immediately after forms are removed and finishing operations have been completed. Prior to the application of the liquid the concrete shall be protected and kept moist as required herein.

45.19 Removal of Falsework and Forms. Change to read as follows:

In the determination of the time for removal of falsework, forms, and housing, and the discontinuance of heating, consideration shall be given to the location and character of the structure, the weather and other conditions influencing the setting of the concrete, and the materials used in the mix.

Methods of form removal likely to cause overstressing of the concrete shall not be used. In general, the forms shall be removed from the bottom upwards. Forms and their supports shall not be removed without the approval of the engineer. Supports shall be removed in such a manner as to permit the concrete to uniformly and gradually take the stresses due to its own weight.

When required by the engineer, field operations shall be controlled by beam and cylinder tests and the removal of forms, supports, and housing, and the discontinuance of heating and curing may be begun when the modulus of rupture or the compressive strength reaches the value which shall be fixed by the engineer for the particular method of testing which is to be used. The beams or cylinders shall be cured under conditions which are not more favorable than the most unfavorable conditions for the portions of the concrete which the specimens represent.

If the field operations arenot controlled by beam or cylinder tests, the following period, exclusive of days when the temperature is below forty (40) degrees F. shall apply to removal of forms:

| | |
|---|---|
| Arch centers | 14 days |
| Centering under beams | 14 days |
| Floor Slabs | 14 days |
| Walls | 1 day |
| Columns | 5 days |
| Side of beams and all other parts | 1 day |

If Type III cement is used, this period may be reduced as directed by the engineer.

In order to make possible the obtaining of a satisfactory surface finish, forms for ornamental work, railings, and parapets shall be removed in not less than twelve (12) nor more than forty-eight(48) hours depending upon the weather conditions.

Forms shall always be removed from columns before removing shoring from beneath beams and girders in order to determine the condition of the concrete in the columns.

No superimposed load, either live or dead, shall be allowed upon the structure within twenty-eight (28) days or until test cylinders show a strength equal to the required twenty-eight (28) day strength. Falsework and centering for arches shall not be struck until the fill back of the abutments has been placed up to the spring line. Falsework for rigid frame structures shall not be removed until the fill has been placed back of the vertical legs as specified in Section 21, "Backfill".

45.21 Finishing. Add the following:

Finishing of concrete may be eliminated, except on curbs and concrete rails and rail posts of bridges, provided that the surface of the concrete after removal of forms, is dense, smooth and even, is without stone or sand pockets, has no form marks, or has minor form marks arranged in symmetrical panels, and the whole presents a neat, pleasing appearance. If, in the opinion of the engineer, such surface is secured, the only work required will be pointing of tie bolt holes with mortar as required in Article 45.20. Should there be any blemishes which require patching or should there be excessive form marks or other defects the entire exposed surface shall be stoned as required above or as directed by the engineer.

45.25 Basis of Payment. Change to read as follows:

The yardage, determined as provided above, shall be paid for at the contract unit price bid per cubic yard for "Class A Concrete," "Class AA Concrete," "Class B Concrete," "Class BA Concrete," "Class C Concrete," "Class CA Concrete," "Class D Concrete," "Class DA Concrete," or"Cyclopean Concrete" as the case may be. If such an item is shown in the proposal form, concrete slope pavement shall be paid for at the contract unit price bid per cubic yard for "Class A Concrete Slope Pavement" or "Class AA Concrete Slope Pavement" as the case may be; concrete railing shall be paid for at the contract unit price bid per linear foot for "Concrete Rail". Such payment shall be full compensation for the concrete; for all materials including expansion joint filler, non-metallic drains, timber bumpers, forms, falsework, placing and finishing; and for all labor, materials, tools, supplies, equipment, and incidentals necessary to complete the item. Reinforcing steel, including metal drains, water stops, expansion joint angles, when there is no item for structural steel in the proposal, shall be measured and paid for as specified in Section 46.

## SECTION 46 - REINFORCING STEEL

46.5 Fabrication. Change to read as follows:

Bent bar reinforcement shall be cold bent to the shape shown on the plans;

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and, unless otherwise provided on the plans or by authorization, bends shall be made in accordance with the following requirements:

Stirrups and tie bars shall be bent around a pin having a diameter not less than two (2) times the minimum thickness of bar. Bends for other bars shall be made around a pin having a diameter not less than six (6) times the minimum thickness, except that for bars larger than one (1) inch the bend shall be made around a pin of eight (8) bar diameters.

Reinforcing bars shall be cut and bent at the mill or shop before shipment to the work. Bending in the field will not be permitted except to correct errors, deformations due to handling, or minor omissions in shop fabrication.

Bar reinforcement shall be shipped in standard bundles, tagged and marked in accordance with the Manual of Recommended Practice for Detailing Reinforced Concrete Highway Structures of the American Association of State Highway Officials.

46.8 Splicing. Change to read as follows:

All reinforcement bars shall be furnished in the full lengths indicated on the plans. Splicing of bars, except where shown on the plans, will not be permitted without the written approval of the engineer. Splices shall be staggered as far as possible. Unless otherwise shown on the plans, bars near the top of beams and girders having more than twelve (12) inches of concrete under the bars shall be lapped thirty-five (35) diameters and all other bars shall be lapped twenty (20) diameters to make the splice. In lapped splices, the bars shall be placed in contact and wired together. Welding of reinforcing steel shall be done only if detailed on the plans or authorized by the engineer in writing. Welding shall conform to the specifications for Welded Highway and Railway Bridges of the American Welding Society.

Sheets of mesh reinforcement shall overlap each other sufficiently to maintain a uniform strength and shallbe securely fastened at the ends and edges. The edge lap shall not be less than one (1) mesh in width.

46.10 Method of Measurement. Change to read as follows:

The quantity of bar reinforcing steel to be paid for shall be the total weight in pounds actually in place, as shown on the plans or revised by the authority of the engineer, based on calculated weights shown in the table below. The weight paid for shall not include the extra metal used when bars larger than those specified are substituted by permission of the engineer, the extra metal necessary for splices not indicated on the plans, nor weight of any device used to support or fasten the steel in its correct position. In the case of structures of reinforced concrete where there is no proposal item for structural steel, such minor metal parts as expansion joints, bolts, drains, and the like shall, unless otherwise specified, be measured as reinforcement.

If such an item is shownin the proposal form, the quantity of mesh reinforcement to be paid for shall be the number of square yards computed by multiplying the width of the section to be reinforced by its length. No allowance shall be made for laps.

The calculated weights of plain and deformed bars shall be based on the following table:

| Size No. | Nominal Diameter In Inches | Weight Per Foot In Pounds |
|---|---|---|
| 2 | 0.250 | 0.167 |
| 3 | 0.375 | 0.376 |
| 4 | 0.500 | 0.668 |
| 5 | 0.625 | 1.043 |
| 6 | 0.750 | 1.502 |
| 7 | 0.875 | 2.044 |
| 8 | 1.00 | 2.670 |
| 9 | 1.128 | 3.400 |
| 10 | 1.270 | 4.303 |
| 11 | 1.410 | 5.313 |

## SECTION 52 - PIPE CULVERTS

52.4 Laying Pipe - General. Change to read as follows:

Culverts under the highway shall be placed so that the minimum distance from the finished grade to the top of pipe shall be not less than shown in the table below:

Round or Elliptical Pipe

| Surface Pavements | Base of Measurement | Up to 120" Dia. | Over 120" Dia. | Arches | Pipe Arches |
|---|---|---|---|---|---|
| Unpaved and flexible | Top of Surface | D/5 or 12" Minimum | 24" Minimum | S/15 or 12" min. | S/10 or 12" min. |
| Rigid | Top of Slab | D/7 or (minimum of 3 inches cushion under slab) | 18" min. | S/20 | S/14 |

Note: Covers shown in table above are for finished construction. During construction, adequate cover shall be provided to protect the structure from damage.

52.6 Laying Sectional Plate Pipe. Change article title and first paragraph as follows:

52.6 Laying Structural Plate Pipe.

Where structural plate pipe is to be installed in new embankment, the embankment shall be constructed to the elevation of the third point of the diameter of the pipe, after which the trench shall be excavated and the pipe installed.

52.7 Laying Vitrified Clay, Reinforced Concrete, or Plain Concrete Pipe. Add the following:

The first section of pipe to be laid shall be firmly placed to the designated line and grade with the groove end pointing in the direction to be followed by the pipe.

The abutting ends of the sections of pipe to be jointed shall then be cleaned and wetted, after which laying mortar shall be firmly placed into the lower half of the groove end of the preivously laid section. Laying mortar shall be firmly placed in the top half of the tongue end of the section to be jointed which shall then be inserted truly and snugly into the groove end of the section previously laid, so as to completely fill the joint.

The interior joint shall then be either brushed or pointed and all surplus mortar removed from the pipe. The external space between the ends of the jointed pipe shall be firmly filled from the outside with laying mortar.

When pipe with self-centering joints and without an inside pointing recess is furnished, the inside shoulder of the groove end of each section shall first be lightly plastered or buttered with laying mortar after which the pipe ends shall be firmly fitted together in such a way that the tongue end of each section fits snugly into the groove end of the preceding section in order to center the joint and form a true flow line. The inside joints shall be troweled or brushed smooth and excess mortar removed from the pipe. The outside joint recesses shall then be filled with mortar.

When pipe is furnished with self-centering joints with both inside and outside pointing recesses, the pipe shall be firmly fitted together in such a way that the tongue end of each section fits snugly into the groove end of the preceding section in order to center the joint and form a true flow line, after which the inside joint recess shall be firmly filled with pointing mortar and then troweled or brushed smooth and excess mortar removed from the pipe. The outside joint recesses shall then be filled with mortar.

52.9 Method of Measurement. Change to read as follows:

The length of pipe culverts to be paid for shall be the actual number of linear feet of culvert in place, but this length shall not be greater than shown on the plans or specified by the engineer. No allowances shall be made for cut-offs on a skew when the pipe is ordered mitered at the factory. When skew cut-offs are ordered in the field, full allowance shall be made for necessary length of pipe cut-off due to skew.

Structural plate culvert pipe shall be measured as follows:

Pipes with square and vertical ends, end to end of metal, on center line of structure.

Pipes with skewed and vertical ends, end to end, on center line.

Pipes with square ends, beveled, average end to end at top and bottom of pipe, parallel to center line.

No allowances shall be made for overlaps when lighter gage sections are jointed to heavier gage sections to form one continuous culvert.

52.10 Basis of Payment. Change to read as follows:

This item, measured as provided above, shall be paid for at the contract unit price per linear foot for "_____inch Corrugated Metal Pipe", "_____inch by _____inch Corrugated Metal Arch Pipe," "_____inch Structural Plate Pipe (number of plates and gage)," "_____inch Vitrified Pipe," "_____inch Reinforced Concrete Pipe," "_____inch Plain Concrete Pipe," or "_____inch Corrugated Metal Siphon Pipe," as the case may be, which price shall be full compensation for all labor, materials, tools, supplies, equipment, and incidentals necessary to complete the culvert in accordance with the plans and these specifications, including band couplings or other devices to connect additional lengths to existing culverts.

Necessary excavation shall be measured and paid for as provided under "Structure Excavation," Section 20, except that when embankments are ordered constructed prior to installation of culverts, no quantities shall be measured for payment outside required elevations above the pipe.

Backfill, including the amount necessary to replace excavation below the grade of the pipe when required due to the character of material encountered, shall be paid for as specified under "Backfill", Section 21.

## SECTION 54 - UNDERDRAINS

54.2 Materials. Change to read as follows:

All materials shall conform to the requirements of Part III, Material Details. Specific reference to Part III are as follows:

| | |
|---|---|
| Water | Section 70 |
| Gravel for Bedding and Backfill | Section 77 |
| Portland Cement | Section 89 |
| Perforated Corrugated Metal Pipe | Section 95 |
| Drain Tile | Section 99 |

## SECTION 63 - PRESERVATIVE TREATMENTS FOR TIMBER

Change entire specification:

63.1 Description. Preservative treatment of approved lumber, timber and piles shall consist of the types of treatment specified in pertinent sections of the Standard Specifications, as shown on the plans or required by the Special Provisions.

63.2 Materials. The materials used shall be those prescribed for the several items which constitute the finished work and shall comply with all the requirements for such materials as set forth in these specifications.

63.3 General Requirements. Where painting of treated timber and lumber is indicated on the plans or set forth in these specifications, such lumber and timber that is to be painted with oil paints shall not be treated with creosote, creosote solutions, or oil-borne preservatives.

All timber and lumber treated with water-borne preservative shall be air-dried or kiln-dried after treatment and before use, to a moisture content that will not interfere with the application or retention of paint. It shall be the responsibility of the contractor to purchase the material in time to permit proper air-drying. In event of failure to place orders in time for air-drying, the cost and expense of kiln-drying shall be borne by the contractor.

Timbers of different size and retention requirement shall be treated in separate charges, except when the quantity of material ordered is insufficient, in which case timber of different size and retention requirements may be treated in the same charge, provided the total net retention for the charge shall not be less than the sum of the required retention for the quantities of each size-group in the same charge.

Round material and sawed material shall not be treated in the same charge.

Treated lumber, timber and piles shall be free from heat checks, water bursts, excessive checking, results of chafing, or from any otherdamage or defects which would impair their usefulness or durability for the purpose intended. The use of anti-splitting iron for repairing, or preventing checks, splits or other defects will not be permitted.

Empty-cell treatment shall be used with preservative oils and oil-borne preservatives except when the retention specified is greater than can be obtained by an empty-cell process. Water-borne preservatives may be injected by either a full-cell or an empty-cell process.

63.4 Treatment and Retention. Unless otherwise specified in the Special Provisions or revised herein, the treatment to be used and the amount of preservative to be retained shall meet the requirements of the current "Standard for Pressure Preserved Wood for Highway Construction, C-14," of the American Wood-Preservers Association. Maximum possible retentions are recommended but in no case shall the retention be less than the minimum indicated herein or in the above mentioned A.W.P.A. Standard C-14. The following additional preservative is included as an alternate to those listed in A.W.P.A., C-14, and when specified herein, or when shown on the plans, shall be used and the requirements of the above standard shall apply, except as follows:

Chemonite----------Min. net retention, pounds per cu. foot 0.50; full-cell process; max. temp. of treating bath 150° F.

63.5 Inspection. Timber, lumber and piles to be treated shall be inspected at the sawmill or concentration yard for grade suitability by an inspector designated by the engineer in accordance with the provisions of Section 100.

Timber, lumber and piles being treated shall be inspected by an inspector designated by the engineer, in accordance with the current "Standard Instructions for the Inspection of Preservative Treatment of Wood, M-2," of the American Wood-Preservers Association. The inspector shall file with the department the necessary inspection reports prescribed in Article 5.1 of the above mentioned Standard. Each treated pile and piece of treated lumber and timber accepted shall be branded by the inspector on the ends with a copyrighted brand differing from the brand used before treatment. A true impression of such brand shall be filed with the Department. Treated lumber, timber and pile which do not bear in legible form the brands of the inspector for inspections made both before and after treatment shall not be used in the work.

63.6 Wood Preservative for Brush Treatments. The preservative to be used in brush application of lumber, timber and piling where specified shall be either Creosote for Brush or Spray Treatment or Anthracene Oil as specified in the Current "Standards for Preservative Oils for Non-Pressure Treatments, No. P-7," of the American Wood-Preservers Association.

At the time of applying the wood preservative the moisture content of the wood shall not exceed twenty percent (20%) and there shall be no free moisture on the surface thereof. It shall not be applied in wet or damp weather except when the wood on which it is to be applied is adequately protected.

Wood preservative shall be applied with suitable brushes or by other means that will result in adequate penetration.

63.7 Payment. Full compensation for treatment of lumber, timber and piles as herein specified shall be considered as included in the price paid for furnishing treated lumber, timber or piling and no additional allowance will be made therefor.

## SECTION 64 - GUARD RAIL

Change entire Specification to read:

64.1 Description. This item shall consist of furnishing and delivering all necessary posts, steel plate beams, supports, fastenings and fittings, and preparing, assembling, setting and erecting the same; the preservative treatment, and painting of pertinent parts as required by these specifications and shown on the plans, for a completed guard rail of the type, at the locations, and to the lines and grades shown on the plans or ordered by the engineer. Where so required by the plans and proposal or ordered by the engineer, the work done under this item shall also consist of the careful dismantling, removal and re-erecting or storing ( at locations specified on the project) of existing guard rail. This item shall also include the furnishing and erecting of timber curb when so required by the plans, erected in accordance with the plans and these specifications and at locations shown or otherwise ordered.

64.2 Materials. The materials used shall be those prescribed for the several items which constitute the finished work and shall conform with all the requirements for such materials as set out in this specification and in Part III, "Material Details."

Specific reference to Part III is as follows:

Douglas Fir (coast or inland region) ----------Section 100
Western Larch ----------Section 100
Timber Preservatives----------Section 102
Guard Rail Materials----------Section 104

The minimum grade of post supplied when graded under the rules prescribed in Section 100 shall be as follows:

Douglas Fir (Coast) - No. 1 or better Post and Timbers - Paragraph 218
Douglas Fir (Inland) - Struct. Posts & Timbers - Paragraph 608 to 612 incl. & 614
Western Larch - Struct. Posts & Timbers - Paragraph 567 to 570 incl. & 572

64.3 Construction Details. Unless otherwise specified, guard rail shall be constructed with either treated Douglas Fir or Western Larch posts, beam type plates, and fittings, as shown on the plans. Post spacing shall be as shown and guard rails shall be constructed in accordance with the design shown on the plans. The use of more than one type of guard rail on a single porject will not be approved unless so provided in the special provisions or appearing as a contract item in the proposal.

Each post, after fabrication, shall be given a preservative treatment by pressure processes with one of the following in accordance with the provisions of Section 63:

1. Creosote
2. 50-50 Creosote-Petroleum
3. 5% Pentachlorophenol

The minimum retention of preservative in pounds per cubic foot of wood shall be as follows:

1. Creosote - 8 pounds
2. Creosote - Petroleum - 8 pounds
3. Pentachlorophenol - 8 pounds

In long runs of guard rail, a five (5) foot spacing shall be left between end posts at two hundred and fifty (250) foot intervals and end sections shall be installed. In short runs or at the ends of long runs, no spacing willbe required for lengths up to a maximum of four hundred (400) feet.

Posts shall be set plumb, except on superelevated curves where they shall be set perpendicular to the roadbed. Front faces of posts shall form a straight line, except on curves where they shall be a uniform distance from the center line of the roadway. Post holes shall be backfilled in layers with approved material thoroughly rammed with an iron tamping tool in such manner as not to displace the bottom of posts from correct alignment.

Workmanship shall be first class in all respects and framing shall be done and fittings attached in such manner that the rail, after erection, shall be true to line and grade and shall have the proper tension in the rail plates. Care shall be taken to prevent the disturbance of posts during the erection of the rail, and, when necessary, temporary braces shall be installed to insure against post displacement.

Beam type rails shall be erected so that the bolts at expansion joints are located at the centers of the slotted holes.

After erection, all metal parts and fittings, free from coatings of any kind including dirt, rust, and oil or grease, shall be given three coats of paint as specified in Section 66, except that the prescribed priming coat shall be omitted on all metal parts and fittings, which have been either galvanized, or shop prime coated by the manufacturer. Galvanized parts, prior to applying paint, shall be slightly etched with a solution composed of one quart of vinegar to two gallons of water. The surface shall be rinsed with clear water and allowed to dry thoroughly before painting. Prime coat applied by the manufacturer shall be carefully handled to prevent scratching and marring and all such scratches or mars shall be spotted prior to application of specified paint. Post shall not be painted.

After the rail has been painted as specified, nuts fastening rail plate to springs shall be backed off slightly so that the connection is firm but not tight and will permit the slight movement necessary to absorb expansion and contraction of the rail.

Unless otherwise required by the plans, rebuilt units of guard rail shall be of the same type, spacing of members, etc., as original guard rail.

All salvable materials shall be removed and re-erected (or stored if so specified) with reasonable care. Posts, rails, and incidental hardware for

re-erecting rail shall, in all cases, be obtained from salvage sources, but the contractor shall furnish such additional bolts, supports or incidental hardware as may be necessary to complete the guard rail.

When removal and storage is specified, the bolts, supports and other hardware shall be removed from all rails and posts and all parts shall be sorted and stored at the locations specified. Rail and posts shall be properly stacked and miscellaneous hardware shall be sacked or boxed and all such reasonable care exercised in the handling, storage and preservation of materials as will insure the maximum salvage value for the entire operation.

All guard rail removed and re-erected shall be painted with one coat of paint (Section 66 "Painting") after first touching up all spots on which the original paint has been removed or destroyed.

64.4 Method of Measurement. The quantity of new guard rail or re-erected guard rail to be paid for shall be the number of linear feet of rail, complete in place and accepted, measured along the front face of the rail between centers of end posts.

When the plans require that guard rail is to be removed and stored, the amount of guard rail to be paid for shall be the actual number of linear feet of guard rail (measured center to center of end posts in its original position) dismantled, sorted as to members and material, and properly stacked and stored at the locations specified; provided, however,that the above number of linear feet may be reduced in proportion to the amount of unsalvable material produced in the dismantling and storing of materials.

64.5 Basis of Payment. The footage measured as provided above shall be paid for at the contract unit price bid:

Per linear foot for "Standard Steel Guard Rail" which may be either Type A or Type B at the contractor's option, unless otherwise shown on the plans or set forth in the special provisions; which payment shall be full compensation for furnishing, preparing, placing and erecting all material, treating posts, inspection certificates, excavating, and backfilling, painting and for all labor, materials, tools, supplies, equipment and incidentals necesary to complete the work.

Per linear foot for "Remove and Reset Guard Rail" which payment shall be full compensation for dismantling, removing and re-erecting at locations specified and for all labor, tools, supplies, equipment and incidentals necessary to complete the work;

Per linear foot for "Remove Guard Rail" which payment shall be full compensation for dismantling, removing, handling and storing at locations specified and for all labor, tools, supplies, equipment and incidentals necessary to complete the work, provided however, that the quantities to be paid for may be reduced as provided above for producing unsalvable material in dismantling and storing.

## SECTION 65 - CULVERT MARKERS AND GUIDE POSTS

Change entire specification to read:

65.1 Description. Culvert Markers and Guide Posts, conforming to the details

shown on the plans and the provisions of this section, shall be furnished and installed at locations indicated on the plans, directed by the engineer or as herein set forth. Reflectors conforming to the details shown on the plans shall be furnished and installed on the guide posts and culvert markers.

Unless otherwise specified in the special provisions or indicated on the plans, culvert markers and guide posts may be either timber or metal, at the option of the contractor, but only one type may be used on the project.

65.2 Materials. 1. Timber Posts - Timber posts may be either Redwood treated Douglas Fir or treated Western Larch. Redwood posts shall be dense structural grade and Douglas Fir or Larch shall be No. 1 stress grade or better when graded in accordance with the provisions of Section 100 "Timber".

Douglas fir and Western Larch shall be pressure treated with Tanalith (Wolman Salts), Chromated zinc chloride, Chromated zinc arsenate (Boliden Salt), or ammoniacal copper arsenate (Chemonite), in accordance with Section 63 of these specifications. The minimum retention of preservative shall be as follows:

| Preservative | AWPA Standard | Retention lbs/cu.ft.min. | Treating Process | Max.temp. of bath ° F. |
|---|---|---|---|---|
| Chromated Zinc Chloride | P5 | 1.0 | Full Cell | 120 |
| Chemonite | P5 | 0.5 | Full Cell | 150 |
| Tanalith | P5 | 0.5 | Full Cell | - |
| Boliden Salt | P5 | 1.00 | Full Cell | 120 |

Timber posts shall be surfaced on four sides and chamfered as shown on the plans.

2. Metal Posts. Metal posts shall be manufactured of ten (10) or eleven (11) gage steel with permissable thickness variation of 0.010 inch. The posts shall be straight, shall be manufactured as one continuous piece of metal with no welded joints, and shall be free of sharp corners or rough or burred surfaces on edges.

After fabrication the post metal shall conform to the test requirements set forth in the following table:

| Property | Test Method | Requirement |
|---|---|---|
| Elongation in 8 inches | ASTM E8 | 10% min. |
| Bend test (Room temperature) | ASTM E16 | 180° d = 3t |
| Impact requirements* | ASTM E23 | 25 foot pounds/min. no cracking |

*Size of specimen shall be nom. thickness x 0.750".

Metal posts shall be galvanized in conformance with the requirements of the curretn ASTM Designation: A123 and painting will not be required.

Target plates shall be fabricated from eighteen (18) gage steel sheet metal or heavier and shall be galvanized. If galvanized metal stock is used, it shall comply with Federal Specifications No. QQ-I-716 for Iron and Steel Sheet, Zinc Coated

(Galvanized), Classes D1, D2, E1 or E2. Any of the listed classes will be acceptable. Any flaking of spelter around punched holes shall be cause for rejection. If bare metal stock is used, all items shall be hot-dipped or electro-galvanized before painting. The weight of the zinc coating shall comply with the above mentioned Federal specifications.

Prior to painting target plates, all fabrication including shearing and the punching of holes shall be done and all dirt, grease or oils shall be removed and the metal prepared by "Bonderizing" or other approved process.

One coat of an approved baking primer shall be applied to the edges and both sides of the plates. The backs and edges of the plates shall then receive one coat and the face shallreceive two coats of baking enamel conforming to the Federal Specification TT-E-489, Class B, or approved qual. A final finish coat shall be applied to the face of the plates and shall consist of clear alkyd melamine or clear alkyd urea formaldehyde baking enamel.

Paint may be applied by either spraying, dipping, roller coating, or other approved method, provided the finished surfaces, including edges, are smooth and paint coats are of uniform thickness.

Each of the above coats shall have a minimum dry film thickness of 0.0005 inch when baked at a temperature of two hundred fifty (250) degrees F. for one hour. The total thickness of coating on the front face shall be a minimum of 0.002 inch and on the back face shallbe a minimum of 0.001 inch.

All painting and fabricating shall be done in a workmanlike manner and shall be subject to inspection and release by the engineer before shipment from the fabricating plant.

3. Hardware. Hardware for attaching the target plates shall consist of round-head galvanized $\frac{1}{4}$ inch machine screws with "Parkerized"treatment, or equal, aluminum finished speed nuts. Washers shall be 5/16 inch I.D. asbestos,not less than 1/32 inch thick.

4. Reflectors. Reflectors shall be a reflectorized material of silver color such as "Scotchlite" manufactured by Minnesota-Mining and Milling Company or an approved equal. The reflectorized material shall be of the design shown on the plans and shall be applied to the markers and posts after erection. The reflectorized material shall be firmly attached to the posts by means of an adhesive designed specifically for this purpose.

65.3 Construction Methods. (a) Installation. The markers and guide posts shall be spaced and erected in the manner indicated on the plans, and shall be set plumb, except on superelevated curves they shall be set perpendicular to the roadbed.

When soil conditions permit metal posts may be driven in place, provided the method of driving does not damage the posts. Metal targets shall be installed after the posts have been set in place.

Posts shall be placed in the ground to the depth shown on the plans. After the posts have been set in position, excepting metal posts that have been driven in place,

the open space around them shall be filled with earth free from rock. The filling material shall be thoroughly watered and tamped into place in such a manner as not to shift the posts from their correct position and to hold the post securely in position.

When the proposal calls for existing culvert markers and guide posts to be removed and reset, the posts in place shall be carefully removed, stockpiled if necessary, and reset at specified locations. Resetting and painting shall be as specified above.

Unless otherwise noted on the plans, guide posts shall be set according to the following data:

(1) On both sides of the roadbed at the beginning and end of each curve, at five hundred (500) foot intervals on tangents, and at four hundred (400) foot intervals on curves having a radius greater than five thousand (5000) feet.

(2) On the inside of curves at five hundred (500) foot intervals up to five thousand (5000) feet radius.

(3) On the outside of curves, the intervals between posts shall be as follows:

| | | | |
|---|---|---|---|
| Radius | 500' | or less | - 50' |
| | 550' | to 1000' | - 75' |
| | 1050' | to 2500' | -100' |
| | 2550' | to 5000' | -200' |

(4) Six guide posts shall be set to outline Type 1 Approaches and two shall be set at Type 2 approaches.

All spacing shown above is approximate only. Posts shall be set as directed by the engineer.

No guide posts will be required on tangents wherethe spacing between culvert markers is less than 750', or in cuts having backslopes steeper than 4:1.

(b) Painting. Guide posts and culvert markers shall be painted in accordance with Section 66 of these specifications except as modified herein.

Painting of galvanized posts will not be required.

Target plates shall be painted as specified under Article 65.2, sub-article (2) of this section.

Timber posts shall be given one coat of wood primer and two coats of finish paint for wood conforming to the provisions of Section 66, and paint shall be applied over a sufficient area to provide a painted surface that will extend at least six (6) inches below the ground surface.

The tops of the markers and guide posts shall be painted black as shown on the plans. Black paint shall conform to the requirements of Section 66.

Before completion of the contract, all areas where the paint has been damaged shall be given a spot coat of paint and all exposed areas that have become soiled shall be cleaned or repainted, and no additional compensation will be allowed for such work.

65.4 Basis of Payment. The contract unit price paid for Culvert Markers or Guide Posts, or any combination thereof as indicated in the Proposal, shall include full compensation for furnishing all labor, materials, tools, supplies and equipment, and doing all the work involved in furnishing and installing the guide posts or culvert markers complete in place as specified. No additional compensation will be allowed for furnishing treated Douglas Fir or treated Western Larch post.

When called for, the number of culvert markers and guide posts removed and reset, complete in place and accepted shall be paid for at the contract unit price bid each for "Remove and Reset Culvert Markers and Guide Posts," which payment shall be full compensation for removing the posts, stockpiling if necessary, painting and resetting them in accordance with this specification, and for all labor, equipment, materials, supplies, tools and incidentals necessary to complete the work specified, including excavation, backfill and disposal of surplus materials.

## SECTION 66 - PAINTING

66.2 Materials. Change to read as follows:

The contractor furnishing paints under thses specifications shall clearly show in his order to the paint supplier that materials are to be used on a State of Nevada Highway project. The contractor shall furnish, without additional charge, a letter from the supplier of paint or paints certifying by means of affidavit, that the material delivered to the contractor is his standard formulation as approved and that the paint products meet or exceed the performance requirements of the specifications set forth in Table I.

The Department reserves the right to sample all shipments of paint, either at destination or point of origin , and to withhold acceptance of paint until analysis of samples is completed. Failure of such samples to meet all of the performance requirements of the Department will be cause for rejection of the paint represented, and the withdrawal of the acceptance of the paint.

66.3 Number of Coats. Change to read as follows:

The number and kinds of coats of paint shall be as set forth in Table I.

TABLE I
(Part A)

IRON & STEEL
USE ITEM: Guard Rail Elements, Standard Metal Rail, Guard Rail Hardware, Steel Right of Way Markers

| Purpose | Number of Coats | Color | General Type | Formula or Specification | Suggested Manufacturer's Brands |
|---|---|---|---|---|---|
| Prime (Applied at Shop) | 1 | - | Red Lead | TT-P-86a | 1. Devoe & Raynolds Co., Inc. - Type III, GS-403<br>2. The Glidden Co. No.- Y-506 Liquid Red Lead<br>3. National Lead Co. - No. 052 Red Lead<br>4. W.P. Fuller & Co. - No. 4550 Ful-Tec Red Lead<br>5. General Paint Corp. No. 2499 Red Lead<br>6. Tnemec Co. Inc. - No. 69 Spec. Red Primer<br>7. Pittsburgh Plate Glass Co. - #LA-6250 Red Lead |
| | | | or Zinc Chromate | JAN-P-735 | 1. General Paint Corp.-#2452 Zinc Chromate<br>2. National Lead Co.-Dutch Boy #041 Zinc Chromate<br>3. Benjamin Moore & Co. - Moore's Iron Clad Zinc Chromate<br>4. Glidden Co. - #34-Y-708 Zinc Chromate |
| Intermediate (First Field Coat after Primer) | 1 | Cream | Titanium Lead, Zinc Oxide | TT-P-102a | 1. Glidden Co. - #15-W-1 Postad<br>2. General Paint Corp. #1013<br>3. National Lead Co.-Dutch Boy #113<br>4. W.P. Fuller & Co. - Pure Prepared Paint<br>5. Benjamin Moore & Co. - 1st Quality Outside Paint |
| Finish | 1 | White | Titanium Lead, Zinc Oxide | TT-P-102a | 1. Glidden Co. - #15-W-1 Postad White<br>2. General Paint Corp. - #1003<br>3. National Lead Co. - Dutch Boy #113<br>4. W. P. Fuller & Co. - Pure Prepared Paint |

TABLE I (Con't)
(Part B)

IRON & STEEL
USE ITEM: Structural Steel, Miscellaneous Iron, Steel Light Standards

| Purpose | Number of Coats | Color | General Type | Formula or Specification | Suggested Manufacturer's Brands |
|---|---|---|---|---|---|
| Prime (Applied at Shop) | 1 | - | Red Lead or Zinc Chromate | Fed. Spec. No. TT-P-86a | See Part A. |
| Intermediate (first field coat after Primer) | 1 | Light Gray | Titanium Lead, Zinc Oxide | Red. Spec. No. TT-P-102a | 1. Glidden Co. - #15-W-1 Postad (Tinted)<br>2. General Paint Corp. - #1003 (Tinted)<br>3. National Lead Co. - Dutch Boy #113 (Tinted)<br>4. W.P. Fuller & Co.-Pure Prepared Paint (Tinted)<br>5. Benjamin Moore & Co. - 1st Quality Outside Paint (Tinted) |
| Finish (Second field coat after primer | 1 | - | Aluminum | Navy Spec. No. TT-V-81b Mixing Varnish. Aluminum Paste TT-A-468A, Type II | 1. The Glidden Co. - #Y-592 Exterior Metalite<br>2. General Paint Corp. - #3001 Bitulumin<br>3. Benjamin Moore & Co. - Weatherproof Aluminum<br>4. National Lead Co. - Dutch Boy 29-oz. R.M. Aluminum |

TABLE I (Cont.)
(Part C)

TIMBER

USE ITEM: Timber Culvert Markers, Guide Posts, Cattle Guard Wings, Bridge Railings, Right-of-Way Markers, Sign Posts, and Miscellaneous Structures specified to receive paint.

| Purpose | Number of Coats | Color | General Type | Formula or Specification | Suggested Manufacturer's Brands |
|---|---|---|---|---|---|
| Prime | 1 | White | Mixed Pigment Exterior<br>Wood Primer | TT-B-25a | 1. General Paint Corp. #1025 Prime-Tite<br>2. Sherwin-Williams SWP #450 Undercoater<br>3. National Lead Co. Dutch Boy #010 Primer<br>4. Devoe & Raynolds Co. #102 H.P. White Undercoater<br>5. W.P. Fuller & Co. Pure Prepared Primer |
| Intermediate (First coat after prime) | 1 | Cream | Titanium Lead, Zinc Oxide | TT-P-102a | 1. General Paint Corp. #1013 100% Pure Paint<br>2. National Lead Co. Dutch Boy #113<br>3. The Glidden Co. #15-W-1 (Tinted)<br>4. W.P. Fuller & Co. Pure Prepared Paint<br>5. Benjamin Moore & Co. 1st Quality Outside Paint |
| Finish (Second Coat after primer) | 1 | White | Titanium Lead, Zinc Oxide | TT-P-102a | 1. General Paint Corp. #1003 100% Pure Paint<br>2. National Lead Co. Dutch Boy #113<br>3. W.P. Fuller & Co. Pure Prepared Paint<br>4. Benjamin Moore & Co. 1st Quality Outside Paint<br>5. The Glidden Co. #15-W-1 Postad |
| Trim, Lettering & Indications (Used when so indicated on plans) | 1 | Black | Titanium Lead, Zinc Oxide | TT-P-61a | 1. National Lead Co. Dutch Boy #290<br>2. General Paint Corp. #1057 100% Pure Paint<br>3. W. P. Fuller & Co. Black Pure Prepared Paint<br>4. Benjamin Moore & Co. Black Decorative Trim<br>5. Devoe & Raynolds Co. - #103 H.P. Sash & Trim |

TABLE 1 (Cont.)
( Part D )

CONCRETE
USE ITEM: Concrete End Posts, (Bridges), Raised traffic bars, and miscellaneous concrete specified to receive paint.

| Purpose | Number of Coats | Color | General Type | Formula or Specification | Suggested Manufacturer's Brands |
|---|---|---|---|---|---|
| Finish | 1 | White | Water thinned | Acrylic Resin or Synthetic Latex Alkyd Emulsion | 1. General Paint Co. - "Faze"<br>2. Intercoastal Paint Co. - # 303 or # 202 |

66.8 Field Painting of Steel. Add the following:

The total dry film thickness of undercoats shall not be less than two (2) mils and the dry film thickness of the finish coat shall not be less than one (1) mil.

Excessively thick coats of paint will not be permitted. The thickness of each coat shall be limited to that which will result in uniform drying throughout the paint film.

Succeeding coats of paint shall be of such shade as to contrast sharply with the coat being covered.

66.9 Painting Timber. Change to read as follows:

All cracked or pealed paint, loose chalky paint, dirt and other foreign matter shall be removed by wire brushing, scraping or other approved methods immediately prior to painting. Unpainted timber shall be thoroughly dry before paint is applied.

When permitted by the engineer, the first coat of paint may be applied prior to erection.

After the first coat has thoroughly dried, all cracks, checks, nail holes, etc., shall be puttied flush with the surface and allowed to dry before the second coat is applied.

Succeeding coats of paint shall not be applied until at least three (3) days after the preceding coat has hardened enough to prevent breaking under the brush.

Skips, holidays, thin areas or other deficiencies in any one coat of paint shall be corrected to the satisfaction of the engineer before the succeeding coat is applied.

The surface of the paint coat being covered shall be free of any deleterious material before any additional paint is applied.

## SECTION 67 - FENCING

67.3 Construction Methods. Change tne last two paragraphs to read:

Unless otherwise specified fences which are the property of the Department shall be placed in such a position that the posts are in the right of way and the wire, pickets or board rails are set directly on the right of way lines.

Unless otherwise specified fences which are the property of abutting land owners shall be placed with the posts on the owners property immediately outside the right of way.

67.4 Method of Measurement. Add the following:

When "Missouri Gates" are indicated on the plans to be installed they shall be measured as linear feet of fence. No measurement shall be made as gates.

67.5 Basis of payment. Add the following:

"Missouri Gates" shall be paid for as linear feet of fence. No payment shall be made as gates.

SECTION 68 - Change the entire specification to read:

## SECTION 68 - REFERENCE MONUMENTS

68.1 Description. This item shall consist of constructing Portland cement concrete monuments of the design and at the locations indicated on the plans or directed by the engineer.

68.2 Materials. All materials shall conform to the requirements of Part III, "Material Details". Specific reference to Part III are as follows:

| | |
|---|---|
| Water | Section 70 |
| Coarse aggregate for Portland cement concrete | Section 76 |
| Fine aggregate for Portland cement concrete | Section 81 |
| Portland cement | Section 89 |

Bronze disks will be furnished by the Department.

68.3 Construction Methods. Monuments shall be constructed of Portland Cement Concrete, in accordance with the applicable provisions of Section 45, "Concrete Structures." The class of cement concrete to be used shall be as shown on the plans or set forth in the Special Provisions.

These monuments shall be set to assist in reestablishment of the centerline for future use and shall be set at the beginning and end of each project, at the beginning and end of each curve, and approximately 1/2 mile apart on long tangents.

These monuments located as outlined above, shall be established outside construction limits, and the exact location will be that determined by the engineer.

A hole just large enough for the monument shall be excavated for the required depth. If solid rock is reached before the required depth is reached the monument may be built on this instead of being built to its full depth. This hole shall be filled with the cement concrete. When the concrete has set sufficiently the bronze disk or a plug shall be installed in the exact position required by the engineer.

68.4 Method of Measurement and Basis of Payment. This work shall be paid for at the contract unit price each for "Reference Monuments" complete in place, which price shall be full compensation for all labor, materials, tools, supplies, equipment, and incidentals necessary to complete the work, including excavation, backfill, and disposal of surplus excavated material.

# PART III

## MATERIAL DETAILS

### SECTION 74 - CRUSHED ROCK AND SCREENINGS FOR ROAD TREATMENT WITH BITUMINOUS MATERIALS

74.6 Size Requirements, Screenings for Bituminous Surface Treatment. Change to read as follows:

The aggregate shall conform to one of the following sieve analysis, as specified.

| Laboratory Sieve Square Openings | Percentage by Weight Passing Sieve | |
|---|---|---|
| | 1/2 inch size | 3/8 inch size |
| 1/2 inch | 100 | -- |
| 3/8 inch | 75-90 | 100 |
| No. 4 | 8-30 | 30-60 |
| No. 10 | 0-8 | 0-8 |
| No. 200 | 0-2 | 0-2 |

### SECTION 84 - LIQUID ASPHALT

84.2 Test Reports, Shipping Notice and Preliminary Sample. Change to read as follows:

(a) Contractors, vendors, and manufacturers responsibility. At the time of contract award, the contractor shall furnish to the department the name and address of the vendor and/or the manufacturer furnishing the liquid asphalt proposed for use on the project.

If so required by the engineer, the manufacturer shall ship by prepaid express a representative sample of each classification and grade of liquid asphalt proposed for use on the project for testing by the department, and department approval must be obtained prior to ordering shipment.

The vendor of material shall cooperate with representatives of the department in obtaining samples for department testing.

The vendor of the liquid asphalt shall provide a letter of guarantee to the engineer and the contractor stating that each car or truck transport load of material shipped to the project will meet the requirements of these specifications, and that he (the vendor) assumes full responsibility for any dilutents or contaminants, remaining as residue from previous loadings of cars or truck tankers which change the qualtity of the material delivered to the project. Liquid asphalt shipped in cars or truck tankers containing residue from previous loadings in the form of dilutents or contaminants will not be paid for at the invoice quantity but will be rejected or otherwise assessed damages based upon the effects of the dilution or contamination.

(b) Shipping Notice. The Division Engineer of the division to which shipment is made shall be notified immediately, by wire, (teletype or telegraph) upon making shipment and confirming shipping notices shall be mailed immediately thereafter. One copy of the shipping notice shall be mailed to the State Highway Engineer at Carson City, Nevada and two copies shall be mailed to the Division Engineer of the Division to which shipment is made.

The notice by wire shall contain the following data:

1. Consignee & Destination
2. State Contract Number (or State Purchase Order Number, if applicable)
3. Date shipped
4. Net Quantity
5. Car Intials and number or truck transport delivery ticket number
6. Type and grade of material

The mailed notice shall contain the following data:

1. Consignee & Destination
2. State Contract Number (or State Purchase Order Number, if applicable).
3. Delivery point
4. Date shipped
5. Car initial and number or truck transport delivery ticket number
6. Type and grade of material
7. Quantity loaded
8. Loading temperature
9. Net quantity
10. Signature of shipper or authorized representative

(c) Refinery Test Reports. Refinery test reports shall be mailed to the State Highway Engineer, Carson City, Nevada as soon as tests have been completed, and the reports shall contain the following data:

1. Date of Shipment
2. Car Initials and number or truck transport delivery ticket number

3. Destination and Consignee
4. State Contract Number ( or State Purchase Order Number if applicable)
5. Type and grade of material
6. Certificate of grade (certify that material conforms to these specifications,and itemize results on tests performed)
7. Signature of refinery's authorized representative

## SECTION 85 - EMULSIFIED ASPHALT

Change entire specification to read:

85.1 Material Covered. This specification covers the quality of emulsified asphalts. Emulsified asphalt as designated herein shall be composed of an intimate homogeneous mixture of base asphalt and an emulsifying agent held in suspension in water.

85.2 General Requirements. (a) Contractors, vendors and manufacturers responsibility. At the time of contract award, the contractor shall furnish to the department the name and address of the vendor and of the manufacturer furnishing the emulsified asphalt proposed for use on the project.

If so required by the engineer, the manufacturer shallship by prepaid express a representative sample of each classification and grade of emulsified asphalt proposed for use on the project for testing by the department, and department approval must be obtained prior to ordering shipment.

The vendor of material shall cooperate with representatives of the department in obtaining samples for department testing.

The vendor of the emulsified asphalt shall provide a letter of guarantee to the engineer and the contractor stating that each car or truck transport load of material shipped to the project will meet the requirements of these specifications and that he (the vendor) assumes full responsibility for any dilutents or contaminants, remaining as residue from previous loadings of cars or truck tankers which change the quality of the material delivered to the project. Emulsified asphalts shipped in cars or truck tankers containing residue from previous loadings in the form of dilutents or contaminants will not be paid for at the invoice quantity but will be rejected or otherwise assessed damages based upon the effects of the dilution or contamination.

(b) Shipping Notice. The Division Engineer of the Division to which shipment is made shall be notified immediately, by wire (teletype or telegraph) upon making shipment and confirming shipping notices shall be mailed immediately thereafter. One copy of the shipping notice shall be mailed to the State Highway Engineer at Carson City, Nevada, and two copies shall be mailed to theDivision Engineer of the Division to which shipment is made.

The notice by wire shall contain the following data:

1. Consignee & Destination
2. State Contract Number (or State Purchase Order Number, if applicable)

3. Date shipped
4. Net Quantity
5. Car Initials and number or truck transport delivery ticket number
6. Type and grade of material

The mailed notice shall contain the following data:

1. Consignee and Destination
2. State Contract Number (or State Purchase Order Number, if applicable)
3. Delivery point
4. Date Shipped
5. Car Initial and number or truck transport delivery ticket number
6. Type and grade of material
7. Quantity loaded
8. Loading temperature
9. Net quantity
10. Signature of shipper or authorized representative

(c) Refinery Test Reports. Refinery test reports shall be mailed to the State Highway Engineer, Carson City, Nevada, as soon as tests have been completed, and the reports shall contain the following data:

1. Date of shipment
2. Car initials and number or truck transport delivery ticket number
3. Destination and consignee
4. State Contract Number (or State Purchase Order Number if applicable)
5. Type and grade of material
6. Certificate of grade (certify that material conforms to these specifications, and itemize results on tests performed)
7. Signature of refinery's authorized representative

85.3 Specific Requirements. (a) Emulsified Asphalt, Type RS-1. This emulsion is a quick breaking type, intended to be used where a relatively low viscosity and asphalt content is desired. Its principal uses are in penetration work and seal coating, and shall contain an asphalt base of one of the following as specified:

(1) Liquid Asphalt, Type SC-6, conforming to Section 84, of these specifications.

(2) Asphalt Cement, 150 to 200 penetration conforming to Section 86, of these specifications.

(b) Emulsified Asphalt, Type RS-2. This emulsion is a quick breaking, high viscosity, relatively high asphalt content type, intended to be used for surface treatment and sealing. It shall be of a consistency suitable for application through a pressure distributor heated to a temperature of one hundred and twenty (120) to one hundred and fifty (150) ° F. and shall contain an asphalt base of one of the following, as specified:

(1) Liquid Asphalt, Type SC-6, conforming to Section 84, of these Specifications.

(2) Asphalt Cement, 150 to 200 penetration conforming to Section 86, of these specifications.

(c) Emulsified asphalt, Type MS-1. This emulsion is a medium breaking, low consistency asphalt intended for use in mixes and shall contain as asphalt base of one of the following, as specified:

(1) Liquid Asphalt, Type SC-6, conforming to Section 84, of these specifications.

(2) Asphalt Cement, 70 to 85 penetration or 150 to 200 penetration conforming to Section 86, of these specifications.

Emulsified asphalt shall conform to the requirements of Table I for the type and grade specified when tested in accordance with A.A.S.H.O. as is enumerated.

TABLE I - REQUIREMENTS FOR EMULSIFIED ASPHALT

| TEST | A.A.S.H.O. TEST METHOD | GRADES | | |
|---|---|---|---|---|
| | | RS-1 | RS-2 | MS-1 |
| Viscosity, Saybolt Furol at 77° F., Sec. | T-59 | 20-55 | - | 20-55 |
| at 122° F., Sec. | T-59 | - | 100-400 | - |
| Residue by distillation at 325° F., % - minimum | Nev. Sec.6 | 55 | 55 | 55 |
| Settlement, 5 days, % maximum | T-59 | 3 | 3 | 5 |
| * Demulsibility, 50 ml of 0.1N, $CaCl_2$% | T-59 | - | - | 30 max. |
| * Demulsibility, 35 ml of 0.02N, $CaCl_2$% | T-59 | 60 min. | 45-100 | - |
| Sieve Test, % maximum | T-59 | 0.10 | 0.10 | 0.10 |
| Miscibility with water | | - | - | a |
| Cement Mixing Test, % maximum | T-59 | - | - | - |
| Coating Test | T-59 | - | - | b |

* The demulsibility test shall be made within 30 days after shipment

a - No coagulation in two (2) hours

b - No appreciable separation in three (3) minutes

Note: - Emulsified asphalt samples shall be shipped in clean glass or black iron containers.

## SECTION 86 - ASPHALT CEMENT

Change entire specification to read:

86.1 Material Covered. This specification covers the quality of asphalt cement prepared from petroleum fo use in bituminous mixes.

86.2 General Requirements. (a) Contractors, vendors, and manufacturers responsibility. At the time of contract award, the contractor shall furnish to the department the name and address of the vendor and/or the manufacturer furnishing the asphalt cement proposed for use on the project.

If so required by the engineer, the manufacturer shall ship by prepaid express a representative sample of each classification and grade of asphalt cement proposed for use on the project for testing by the department, and department approval must be obtained prior to ordering shipment.

The vendor of material shall cooperate with representatives of the department in obtaining samples for department testing.

The vendor of the asphalt cement shall provide a letter of guarantee to the engineer and the contractor stating that each car or truck transport load of material shipped to the project will meet the requirements of these specifications, and that he (the vendor) assumes full responsibility for any dilutents or contaminants, remaining as residue from previous loadings of cars or truck tankers which change the quality of the material delivered to the project. Asphalt cement shipped in cars or truck tankers containing residue from previous loadings in the form of dilutents or contaminants will not be paid for at the invoice quantity but will be rejected or otherwise assessed damages based upon the effects of the dilution or contamination.

(b) Shipping Notice. The division engineer of the division to which shipment is made shall be notified immediately, by wire, (teletype or telegraph) upon making shipment and confirming shipping notices shall be mailed immediately thereafter. One copy of the shipping notice shall be mailed to the State Highway Engineer at Carson City, Nevada and two copies shall be mailed to the Division Engineer of the division to which shipment is made.

The notice by wire shall contain the following data:

1. Consignee & Destination
2. State Contract Number (or State Purchase Order Number, if applicable)
3. Date Shipped
4. Net Quantity
5. Car Initials and number or truck transport delivery ticket number
6. Type and grade of material

The mailed notice shall contain the following data:

1. Consignee & Destination
2. State Contract Number (or State Purchase Order Number, if applicable)

3. Delivery point
4. Date shipped
5. Car initial and number or truck transport delivery ticket number
6. Type and grade of material
7. Quantity loaded
8. Loading temperature
9. Net quantity
10. Signature of shipper or authorized representative

(c) Refinery Test Reports. Refinery test reports shall be mailed to the State Highway Engineer, Carson City, Nevada as soon as tests have been completed, and the reports shall contain the following data:

1. Date of Shipment
2. Car initial and Number or truck transport delivery ticket number
3. Destination and Consignee
4. State Contract Number (or State Purchase Order Number if applicable)
5. Type and grade of material
6. Certificate of grade (certify that material conforms to these specifications, and itemize results on tests performed).
7. Signature of refinery's authorized representative

86.3 Specific Requirements. Asphalt cement shall be prepared by the distillation of crude petroleum. The asphalt shall be homogeneous, free from water, and shall not foam when heated to 347° F.

These specifications cover the following penetration grades:

40 - 50
50 - 60
60 - 70
70 - 85
85 - 100
100 - 120
120 - 150
150 - 200
200 - 300

The various penetration grades set forth above shall conform to the requirements shown in Table I.

86.4 Sampling and Testing. Sampling and testing shall conform to the following requirements:

| TEST | A.A.S.H.O. TEST METHODS |
|---|---|
| Sampling | T-40 |
| Water | T-55 |
| Penetration | T-49 |
| ~~Solubility - Method~~ No. 1 except cp $CCl_4$ substituted for $CS_2$ | T-44 |
| Ductility | T-51 |

Flash Point- - - - - - - - - - - - - - - - - - - - -T-48
Loss on Heating- - - - - - - - - - - - - - - - - - -T-47
Inorganic Matter (Ash) - - - - - - - - - - - - - - -T-111
Spot Test- - - - - - - - - - - - - - - - - - - - - -T-102

TABLE I

REQUIREMENTS FOR ASPHALT CEMENT ROAD MATERIALS

| TESTS | A.A.S.H.O. TEST METHODS | PENETRATION GRADES | | | |
|---|---|---|---|---|---|
| | | 40 - 120 | 120 - 150 | 150 - 200 | 200 - 300 |
| Penetration of original sample 77° F. 100 gms., 5 sec. Pen. Grade as specified | T-49 | 40-50<br>50-60<br>60-70<br>70-85<br>85-100<br>100-120 | 120-150 | 150-200 | 200-300 |
| Flash Point (cl.op. cup) min. °F. | T-48 | 425 | 400 | 400 | 350 |
| Loss on Heating, 325° F., 5 hrs. max. % | T-47 | 1.0 | 1.0 | 1.0 | 1.0 |
| DUCTILITY 77° F., 5 cm/minute, min. cm | T-51 | 100 | 100 | --- | --- |
| Penetration of residue after heating % of original, min. | T-49 | 80.0 | 70.0 | 70.0 | 65.0 |
| Solubility in $CCl_4$, % min. | T-44 | 99.0 | 99.0 | 99.0 | 99.0 |
| Inorganic Matter (Ash) % max. | T-111 | 1.0 | 1.0 | 1.0 | 1.0 |
| * SPOT TEST: (When specified) | T-102 | | | | |
| Standard Naptha Solvent, | | Neg. | Neg. | Neg. | Neg. |
| Naptha Xylene Solvent, _____% Xylene | | Neg. | Neg. | Neg. | Neg. |
| Heptane Xylene Solvent, _____% Xylene | | Neg. | Neg. | Neg. | Neg. |

* NOTE: The use of the spot test is optional. When specified, the engineer shall indicate whether standard naphtha solvent, the naphtha-xylene solvent or tne heptane-xylene solvent will be used in determining compliance with the requirement and also, in case of the xylene solvents, the percentage of xylene to be used.

## SECTION 89 - PORTLAND CEMENT

Change entire specification to read:

89.1 Material Covered. The cements covered by these specifications are for five (5) types of Portland Cement as required under pertinent sections of these specifications.

89.2 Requirements. The cements shall meet the requirements as set out in the current "Standard Specification for Portland Cement," A.A.S.H.O. Designation: M-85.

Unless otherwise provided or called for in the Special Provisions, Type II "low-alkali cement" shall be used for all cement concrete and mortar used.

89.3 Air-Entraining Agents. Air-entraining agents used as additives, shall be solutions of materials recognized as acceptable additions to cement for these purposes as they appear in Section 45 "Concrete Structures." However, the engineer reserves the right to check at any time by laboratory tests and other means, the suitability of any of the materials so listed and to verify certification of the manufacturer, and the approval of the listed additives in the Special Provisions or herein shall be considered conditional only and contingent upon actual experience with the use of any specified material listed. Approval may be revoked at any time should it develop that unsatisfactory results of whatever nature are encountered with its use.

The solutions of air-entraining agents shall be added to the ingredients for the concrete in such proportions as to yield entrained air within the range prescribed in Section 45 - "Concrete Structures."

## SECTION 90 - STRUCTURAL, RIVET, AND EYEBAR STEEL

Change entire specification to read:

90.1 General. These specifications cover structural steel for highway structures and other structural purposes. Unless otherwise specified, structural carbon steel and structural rivet steel shall be furnished.

90.2 Mill Test Reports. Two certified copies of the mill test report showing the chemical and physical characteristics of each heat from which metal is used shall be furnished by the contractor.

90.3 Requirements. (a) Structural Carbon Steel. Structural carbon steel shall conform to the requirements of the current "Specification for STEEL FOR BRIDGES AND BUILDINGS," A.S.T.M. Designation: A-7.

(b) Structural Rivet Steel. Structural rivet steel shall conform to the requirements of the current "Specification for STRUCTURAL RIVET STEEL," A.S.T.M. Designation: A-141.

(c) Structural Alloy Steel. Structural alloy steel shall conform to the requirements of the current "Specification for LOW-ALLOY STRUCTURAL STEEL", A.S.T.M. Designation: A-242.

(d) Defects. Finished rolled material shall be free from cracks, flaws, injurious seams, laps, blisters, ragged and imperfect edges, and other defects. It shall have a smooth, uniform finish, and shall be straightened in the mill before shipment.

Material shall be free from loose mill scale, rust pits, or other defects affecting its strength or durability.

The engineer reserves the right to reject material which he deems unsuitable for the purpose intended even though the material meets the requirements of the mill tolerances.

## SECTION 92 - REINFORCEMENT

Change entire Specification to read:

92.1 Materials Covered. These specifications cover plain and deformed billet steel and rail steel bars, fabricated steel bar or rod mats or welded steel wire fabric for concrete reinforcement.

92.2 Bar Steel Reinforcement. (a) Bar steel reinforcement shall meet the requirements of the current "Standard Specification for Billet Steel Reinforcement" or "Rail Steel Reinforcement," A.A.S.H.O. Designations: M 31 or M 42, except the cold-twisted or hot-twisted bars will not be acceptable.

(b) Unless otherwise provided on the plans or in the Special Provisions, all bar steel reinforcement shall conform to the requirements of the current "Standard Specification for Minimum Requirements for the Deformations of Deformed Steel Bars for Concrete Reinforcement," A.A.S.H.O. Designation: M 137.

92.3 Fabricated Steel Bar or Rod Mats Reinforcement. Fabricated steel bar or rod mats for concrete reinforcement shall conform to the requirements of the current "Standard Specification for Fabricated Steel Bar or Rod Mats for Concrete Reinforcement," A.A.S.H.O. Designation: M 54.

92.4 Welded Steel Wire Fabric Reinforcement. Welded steel wire fabric shall conform to the requirements of the current "Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement", A.A.S.H.O. Designation: M 55.

92.5 Structural Shapes. Structural shapes used as concrete reinforcement shall conform to the requirements for "Structural Steel" as provided in these specifications.

SECTION 94. Change entire specification to read:

## SECTION 94 - CORRUGATED METAL CULVERT PIPE, SIPHONS AND PLATES FOR STRUCTURAL PLATE PIPE AND ARCHES

94.1 Material Covered. This specification covers corrugated galvanized sheet metal culvert pipe, siphon pipe and corrugated galvanized plates intended for use in the construction of culverts and drainage structures.

94.2 Requirements for Corrugated Metal Culvert Pipe. Corrugated metal pipe shall conform to the requirements of the current "Standard Specifications for Corrugated Metal Culvert Pipe," A.A.S.H.O. Designation: M 36.

94.3 Requirements for Corrugated Metal Culvert Pipe Siphons. The corrugated metal pipe shall conform to the requirements of the current "Standard Specifications for Corrugated Metal Culvert Pipe," A.A.S.H.O. Designation: M 36, with the following exceptions:

(a) Rivets on circumferential seams shall be placed on approximately two and one-half ($2\frac{1}{2}$) inch centers with a maximum spacing of three (3) inches.

(b) Circumferential and longitudinal seams on the outside of the pipe where sheets lap shall be soldered in a workmanlike manner. The solder shall be sweated into the joints using an acetylene torch properly regulated for the purpose. The use of soldering irons on factory seams shall not be permitted.

(c) Sections of siphon pipe shall be joined in the field by means of an approved watertight coupling. All connecting bands shall be circular with no flattened arcs.

(d) All sheets used in any one culvert shall be of the same brand and so far as practicable shall bear the same heat number and coding number.

(e) The engineer reserves the right to inspect and test the siphons after delivery on the work. Injurious defects revealed subsequent to the acceptance of the pipe at the manufacturer's plant will be cause for rejection.

94.4 Requirements for Plates for Structural Plate Pipe and Arches. Plates and bolts for structural plate pipe and arches shall conform to the current specifications for "Structural Plate Pipes and Arches," as set forth in Section 19, Division IV of the "Standard Specifications for Highway Bridges of the A.A.S.H.O." The gage of the plates shall be as required on the plans or in the Special Provisions.

94.5 Requirements for Corrugated Metal Culvert Arch Pipe. The requirements for base metal, spelter coating, riveting, sampling, testing, marking, corrugations, end finish and workmanship shall be as prescribed in the current "Standard Specifications for Corrugated Metal Culvert Pipe," A.A.S.H.O. Designation: M 36 with the following additions:

(a) Field joints shall be made with band couplers made to fit the deformed pipe.

(b) Dimensions, tolerances, areas, and gages shall be in accordance with the following table:

| Span (Inches) | Rise (Inches) | Gage Pipe | Area Sq. Ft. | "T" (Inches) | "B" (Inches) | Gage Bands |
|---|---|---|---|---|---|---|
| 18 | 11 | 14 | 1.1 | 6-1/2 | 4-1/2 | 16 |
| 22 | 13 | 14 | 1.6 | 8-1/4 | 4-3/4 | 16 |
| 29 | 18 | 12 | 2.8 | 12-1/2 | 5-1/2 | 14 |
| 36 | 22 | 12 | 4.4 | 15-3/4 | 6-1/4 | 14 |
| 43 | 27 | 10 | 6.4 | 20 | 7 | 12 |
| 50 | 31 | 10 | 8.7 | 23 | 8 | 12 |
| 58 | 36 | 10 | 11.4 | 26-3/4 | 9-1/4 | 12 |
| 65 | 40 | 10 | 14.3 | 29-1/2 | 10-1/2 | 12 |
| 72 | 44 | 8 | 17.6 | 32-1/4 | 11-3/4 | 10 |

All dimensions as shown in the above table are measured from the inside crests of the corrugations. A tolerance of plus or minus one (1) inch will be permissible in dimension "T" and dimension "B". The dimension "T" and "B" shall be measured vertically from the horizontal line drawn across the widest portion of the arch.

The dimension "T" is the distance from this horizontal line to the highest point of the intrados of the arch. The dimension "B" is the distance from this horizontal line to the lowest portion of the base. The minimum radius of curvature of any part of the arch section shall be four (4) inches.

The lapped longitudinal seams shall be factory riveted and shall be located in the arch above the base at sufficient distance to avoid riveted joints at points of curvature at the base.

94.6 Bituminous Coated Corrugated Metal Pipe. When so required or designated on the plans, or in the special provisions or proposal, pipe culverts and band couplings shall be coated with an approved asphaltic pipe dip at the plant before being shipped. The quality and character of the dip and the method of application shall be such that the coating on the pipe will be tough and pliable and adhere firmly to the spelter.

SECTION 95 - Change the entire Specification to read:

SECTION 95 - CORRUGATED METAL PIPE UNDERDRAINS

95.1 Material Covered. This specification covers the quality of perforated corrugated galvanized sheet metal pipe intended for use in the construction of underdrains.

95.2 Requirements. Perforated corrugated galvanized sheet metal pipe for underdrains shall conform to the requirements of the current Standard Specifications for"Corrugated Metal Pipe Underdrains," A.A.S.H.O. Designation: M 136.

SECTION 99 - Change entire Specification to read:

SECTION 99 - DRAIN TILE

99.1 Material Covered. These specifications cover drain tile for use as underdrains.

99.2 Classes. Unless otherwise provided on the plans or in the special provisions, the tile shall be "Extra Quality Drain Tile."

99.3 Requirements. Drain tile shall conform to the requirements of the current "Standard Specifications for Drain Tile", A.A.S.H.O. Designation: M 66.

SECTION 100 - TIMBER

Change entire specification to read:

100.1 Description. This specification covers general and specific requirements for structural timber, lumber, guard rail posts, guide posts, culvert and right of way markers and miscellaneous items constructed of Forest Products.

100.2 Species of Wood. The standard commercial and botanical names recognized by these specifications are described as follows:

| Standard Commercial Name | Botanical Name |
|---|---|
| Fir, Douglas (Coast) | Pseudotsuga taxifolia (Coast Type) |
| Fir, Douglas (Inland) | Pseudotsuga taxifolia (Inter-mountain Type) |
| Hemlock, West Coast | Tsuga Heterophylla |
| Larch | Larix occidentals |
| Redwood, California | Sequoia sempervirens |

100.3 Grading Rules. Timber and lumber shall be of the stress grade shown on the plans, or as specified in the specifications or in the special provisions.

Douglas Fir (Coast) and West Coast Hemlock shall be graded in accordance with the current "Standard Grading and Dressing Rules for Douglas Fir and West Coast Hemlock", adopted by the West Coast Bureau of Lumber Grades and Inspection.

Redwood shall be graded in accordance with the current Standard Specifications for "Structural Grades of California Redwood Lumber", adopted by the California Redwood Association.

Port Orford Cedar shall be graded in accordance with "Export and Domestic Grading Rules No. 1 for Port Orford Cedar Lumber and Logs", reprinted and distributed by the Pacific Coast Lumber Association.

Western Larch and Douglas Fir (Inland) shall be graded in accordance with the current "Standard Grading Rules", adopted by the Western Pine Association.

100.4 General Requirements. The following general provisions apply to all stress-grades:

All material shall be well manufactured. Only pieces consisting of sound wood, free from decay will be accepted.

All sizes shown on the plans or specified in the special provisions applying to lumber and timber refer to nominal sizes, and the American Standard rough and dressed sizes shall be accepted as conforming thereto.

All timber to be used without preservative treatment shall contain not less than eighty percent (80%) heartwood on any girth, or on any face, side or edge, measured at the point where the greatest amount of sapwood occurs.

For all timber to be pressure treated, there shall be no heartwood requirements, and the amount of sapwood shall not be limited.

All stress grades shall be free of heart center.

Slope of grain shall be measured over a distance sufficiently great to determine the general slope, disregarding slight local deviations. Within the middle half of the length of piece, the slope of grain shall not be steeper than specified in the grading rules. Green timber shipped by rail shall be adequately protected

during transit from uneven seasoning. Stress-grades of Douglas fir shall be end coated with an approved protective coating at the time of manufacture.

Timber to be treated shall be cut, framed, and bored prior to treatment, unless otherwise shown on the plans or specified in the special provisions or permitted in writing by the engineer. When any framing,cutting, or boring of treated timber is permitted, all cuts, holes, etc., shall be thoroughly swabbed with three (3) coats of the same preservative specified for the treatment of timber.

100.5 Inspection. Structural timber shall be subject to the inspection of the engineer at the site of the work, and rejected pieces shall be immediately removed from the work, by the contractor at his own expense.

Each shipment of untreated structural lumber, timber, and piling shall be inspected at the mill or at the dealer's yards by an inspector designated by the engineer and shall be accompanied by an inspection certificate showing the kind , character, amount, grade of material, name of the mill supplying the material, the name and address of the inspector, the date of inspection, and any other pertinent data. One copy of the inspection certificate shall be attached to the car carrying the material or to the material itself in a position which will be readily accessible to the engineer. Copies of each certificate shall be forwarded in quadruplicate to the Department of Highways. The inspector shall stamp each piece of timber with a stamp which has been copyrighted and of which a true impression has been filed with the Department of Highways. Such stamp shall make a clear legible mark and shall designate the inspector and the grade of lumber. Surfaced material shall be inspected after surfacing.

Treated timber shall be inspected before treatement for grade and suitability by an inspector designated by the engineer. The inspector shall stamp the ends of each accepted piece with a suitable stamp which has been copyrighted and of which a true impression has been filed with the Department of Highways.

## SECTION 102 - TIMBER PRESERVATIVES

Change entire specification to read:

102.1 Scope. This specification covers the quality of Creosote, Creosote-Coal Tar Solutions, Creosote-Petroleum Solution, Water-Borne Preservatives, Oil-Borne Preservatives, and Preservative Oils for Non-Pressure Treatments.

102.2 Preservatives. Preservatives used shall be as specified herein, shown on the plans or as specified in the Special Provisions and shall conform to the following current A.W.P.A. Manual Standards:

| | |
|---|---|
| Creosote | P-1 |
| Creosote-Coal Tar(Type A) | P-2 |
| Creosote-Petroleum | P-3 & P-4 |
| Water - Borne | P-5 |
| Oil - Borne | P-8 & P-9 |
| Preservative Oil for Non-Pressure Treatment | P-7 |

102.3 Sampling and Testing. Preservatives shall be sampled and tested in accordance with the following current standard methods:

Analysis of Creosote----------A.W.P.A. A-1
Analysis of Water - Borne Preservatives----------A.W.P.A. A-2
Sampling of Creosote----------A.A.S.H.O. T-60
Analysis of Oil-Borne Preservatives----------A.W.P.A. A-5
Analysis of Chemonite----------Fed. Spec. TT-W-549

SECTION 103 - FENCE MATERIALS

Change entire specification to read:

103.1 Scope. This specification covers the quality of barbed wire, wire fabric, fence posts, gates and miscellaneous fence hardware.

103.2 Timber Posts. (a) End, corner, gate posts and fence bracings shall be sawed posts of Douglas Fir, No. 1 or better posts and timbers of the dimension shown on the Standard Plan.

(b) Line or intermediate braced posts may be split posts, round posts or sawed posts of Doublas Fir, Redwood, Western Redcedar or Larch, manufactured from sound, live trees, well seasoned and free from large knots, shakes or splits or other defects which will impair their strength or durability. Round and split posts shall be free of all bark. Round posts shall be not less than four (4) inches in diameter measured at the small end. Split posts may be triangular, quadrangular or half-round and shall be not less than seventeen (17) inches in circumference (if triangular shaped the smaller face shall be not less than four (4) inches, and if they are four sided the sum of the widths of the two smaller faces shall be not less than six (6) inches by six (6) inches.

The species or style of post shall not be mixed on any one project, but shall be posts of one species and either all split, round or sawed posts, throughout the project.

103.3 Metal Posts. Tubular posts shall be galvanized standard-weight steel pipe conforming to the requirements of the current "Standard Specification for Black and Hot-dipped Zinc (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses", ASTM Designation A120, except that the hydrostatic test will not be required.

(a) Terminal Posts, end, corner, pull and brace posts shall be not less than two and one half ($2\frac{1}{2}$) inches O.D., weighing three and sixty-five one-hundredths (3.65) pounds per linear foot.

(b) Gate posts shall be not less than three (3) inches O.D., weighing five and seventy-nine one-hundredths (5.79) pounds per linear foot.

(c) Line posts and bracing shall be not less than one and five-eights (1-5/8) inches O.D., weighing two and twenty-seven one-hundredths (2.27) pounds per linear foot.

(d) Line posts of "T" or "H" shaped design shall be galvanized or painted with anti-corrosive paint and shall weigh not less than one and four-tenths (1.4) pounds per linear foot less anchor plate. The posts shall be drilled, notched or studded to facilitate fastening the fence and shall be provided with a suitable anchor plate. Each post shall be furnished with not less than seven (7) galvanized wire clamps.

All posts shall be of the length indicated on the Standard Plan "Right of Way Fences".

103.4 Woven Wire Fencing. Farm-Field Fencing shall be composed of number twelve and one-half (12½) steel wire gage size intermediate line and stay wires with number ten (10) steel wire gage size top and bottom wires. Stay wires securely fastened to the line wires shall be provided at intervals of not more than six (6) inches and shall be continuous from top to bottom.

103.5 Barbed Wire. Barbed wire shall be of the four (4) point pattern composed of two (2) strands of No. 12½ Steel Wire gage size copper-bearing wire and No. 14 Steel Wire gage size round barbs. The barbs shall be spaced not more than six (6) inches apart. It shall conform to the requirements of the current "Standard Specification for Zinc-coated (Galvanized) Iron or Steel Barbed Wire", A.S.T.M. designation: A 121, Class 2.

103.6 Staples, Fence Stays, Brace Wire and Nails. The stays shall be not less than No. 10 B & W gage size copper-bearing wire and the Brace Wire shall be not less than No. 9 B & W gage size copper-bearing wire conforming to the requirements of the current "Standard Specification for Zinc-coated Tie Wire," A.S.T.M. Designation: A 112.

Staples shall be made from No. 9 U.S. Steel Wire gage galvanized wire and shall be one and one-half (1½) inches long.

Nails and spikes shall be new, standard, material of such sizes and kinds as are shown on the Standard Plan.

103.7 Metal Gates. (a) Driveways. Gates used for driveways shall be of the single swing type, unless otherwise specified, fifty-four(54) inches in height and shall provide an opening as specified in the plans.

The gate frame shall be formed of not less than one and three-eights (1-3/8) inch O.D. galvanized steel tubing and suitably braced to prevent sag. All joints shall be welded to form a rigid and water-tight frame.

The gate frame shall be filled with fabric meeting the requirements for fabric as specified herein.

The gates shall be furnished complete with approved hinges, latches and auxiliary braces as required.

(b) Walks. Unless otherwise specified, walk gates shall be four (4) feet wide and of the height set forth on the plans.

The gate frame shall be formed of one (1) inch minimum O.D. galvanized steel tubing so constructed and fitted to form a rigid and water-tight frame.

The gate frame shall be filled with fabric meeting the requirements for fabric as specified herein.

The gate shall be furnished complete with approved hinges, latches and auxiliary braces as required.

103.8 Timber Gates. Timber gates shall be constructed from the species of lumber and in accordance with the design, dimension and detail shown on the Standard Plan.

## SECTION 104 - GUARD RAIL MATERIALS

Change entire specification to read:

104.1 Material Covered. This specification covers the materials for use in the construction of guard rail.

104.2 General Requirements. Before any type rail is used, the manufacturer's plans and specifications shall be submitted and approved by the engineer, and the rail shall be constructed in accordance with such plans, except as herein provided. Plans shall show full details of all assemblies.

Sampling and testing shall be done in accordance with standard recognized practice for the units described herein or to the specific method as indicated.

Upon request the contractor shall furnish the engineer with specimens of rail and fittings for testing purposes free of charge.

Two certified copies of mill test reports showing the chemical and physical characteristics from each heat from which metal is used shall be furnished by the contractor.

104.3 Beam Type Rail. The rail element shall consist of steel plates made from open hearth or electric furnace steel. In addition, a two (2) inch test specimen of the steel shall elongate not less than twelve (12) percent.

The plate shall be formed into a beam by shaping the plate to the arc of a circle or by corrugating the plate longitudinally. The finished beam shall be not less than twelve (12) inches wide and shall be of a length equal to the post spacing plus additional length for lapping at joints. The minimum thickness of metal in the plate shall be as specified herein dependent on the shape of the beam.

For beams shaped to the arch of a circle with a horizontal depth of at least one (1) inch and less than three (3) inches. A minimum thickness of metal shall be No. 9 gage (6.25 pounds per square foot.)

When the plate is shaped to the arc of a circle and the depth as a horizontal beam perpendicular to the line of the rail is three (3) inches or more, the minimum thickness of metal shall be No. 10 gage (5.625 pounds per square foot).

When the plate is corrugated longitudinally with a horizontal depth of at least three (3) inches, the minimum thickness of metal shall be No. 12 gage (4.375 pounds per square foot).

The rail element shall be spliced at each post by lapping in the direction of traffic. The holes in the plate nearer the post shall be slotted to facilitate erection and to permit expansion. The rail element shaped to the arc of a circle, including splices shall have an ultimate tensile strength of at least 70,000 pounds, and the rail element corrugated longitudinally including splices shall have an ultimate tensile strength of at least 50,000 pounds.

On curves of one hundred fifty (150) foot radius or less, the rail plates shall be shop curved as required. The radii of curvature shall be in increments

of ten (10) feet from a radius of one hundred fifty (150) to fifty (50) feet inclusive and in increments of five (5) feet from a radius of fifty (50) feet to and including twenty (20) feet.

Where the rail is on a curve the plates at the splice shall make contact throughout the area of the splice, forming the beams before erection if necessary.

The edges of the beam shall be rolled or rounded so that they present no sharp edges. The projecting heads of all connection and splice bolts shall be rounded and shallow so that no appreciable projection will obstruct a vehicle sliding along the rail.

The beams shall be either galvanized or painted in accordance with the requirements specified herein.

104.4 Offset Brackets. Offset brackets may or may not be required depending upon the design of the beam element.

No offset brackets will be required for beams having a depth of three (3) inches or more providing the edges of the plate make contact with the post. If the edges of the plate do not make contact with the post, they shall be horizontally supported by a metal offset bracket which may or may not be resilient.

Beams with a depth of less than three (3) inches shall be offset from the posts with a bracket which will support the rail element five (5) to seven (7) inches from the face of the post. The bracket shall be of a spring type and shall provide support for the beam to resist horizontal forces normal to the face of the beam. The offset spring bracket shall deflect one (1) inch under a compression perpendicular to the line of the rail of not less than three thousand five hundred (3,500) pounds and not more than six thousand (6,000) pounds. It shall not upon release of the first application of this load held for one (1) minute show a permanent deformation greater than three-eights (3/8) inch and upon each succeeding application of the same load held for one (1) minute it shall not show a permanent deflection greater than five (5) percent of the deflection. The permanent set or deformation shall be measured between the point or points of attachment of the bracket and the rail and the base of the bracket. The bracket shall not collapse under a compression load of ten thousand (10,000) pounds. The spring bracket and connection to the post combined shall be capable of supporting a load of two thousand three hundred (2,300) pounds at the rail parallel to the rail.

Non-resilient offset brackets shall be made from cast iron or malleable cast iron and shall be of a design, dimension and weight specified or as approved by the engineer.

The brackets shall be either galvanized or painted in accordance with the requirements specified herein.

104.5 End Details. A short portion of the rail known as the end plate shall project beyond the outside edge of each end post. This plate shall be of the same gage as the rail, shall be securely fastened to the post and rail and shall be bent back from the front line of the rail upon an approximate radius indicated on the plans. Where end posts are adjacent to bridge end posts or railings, it may be directed that the end plate be omitted.

104.6 Fittings. The fittings shall be of the dimensions and material shown on the plans. All metal fittings including bolts, nuts, and washers shall be galvanized.

The fittings shall be of sufficient strength to develop the full strength of the rail elements or as otherwise specified herein.

104.7 Shop Fabrication. All parts of the guard rail shall be fabricated and all holes drilled in the shop ready for immediate and complete installation. No punching, cutting, burning or welding will be permitted in the field. Holes for special details in exceptional cases may be made in the field when approved in writing by the engineer, but such holss shall be drilled.

104.8 Shop Finish. The materials shall be galvanized or painted as specified herein.

1. All metal other than steel sheets required by the plans or specifications to be galvanized shall be galvanized after fabrication to meet the current "Specifications for Zinc, (Hot-Galvanized) Coatings on Structural Steel Shapes, Plates and Bars and their Products", A.S.T.M. designation: A 123. The galvanizing on steel sheet shall conform with the requirements for Class C, zinc coating of the current "Specifications for Zinc-Coated (Galvanized) Iron or Steel Sheets," A.S.T.M. designation: A 93.

2. Shop painting. All metal not required to be galvanized shall after fabrication, be cleaned to a steely brightness and painted in the shop with a coat of approved red lead primer or approved zinc chromate primer.

104.9 Posts. Wood posts shall conform to the requirements for guard rail posts as specified under Section 64.

Add the following new specification:

## SECTION 107 - RIGHT OF WAY MARKERS

107.1 Description. This item shall consist of furnishing all materials and erecting timber posts for right of way markers conforming to these specifications and of the design shown on the plans at points indicated herein or ordered by the engineer.

107.2 Materials. The posts shall be either Redwood, Port Orford Cedar, Douglas Fir, Western Larch or West Coast Hemlock, conforming to the requirements of Section 102. Redwood shall be Dense Structural grade. Port Orford Cedar shall be Dense No. 1. Douglas Fir, Western Larch and Hemlock shall be No. 1 or better.

Douglas Fir, Larch and Hemlock shall be butt treated.

Timber preservatives shall conform to the requirements of Section 102.

Paints shall conform to the requirements of Section 66.

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107.3 Construction Methods. Right of way markers shall be erected to define the right of way lines and, unless otherwise specified shall be set at beginning and end of each project, at beginning and end of each curve, at all corners of irregular right of way lines, and approximately one-half (1/2) mile apart on long tangents. Right of way markers shall be set plumb and the post hole shall be backfilled in layers with approved material thoroughly rammed with an iron tamping tool.

The lower twenty-eight (28) inches of the post shall be given a preservative treatment in accordance with Section 63. When wood is dry and clean, posts shall be given three (3) coats of paint and stenciled letters and trim shall be applied as specified in Section 66.

107.4 Measurement and Payment. The number of right of way markers in the completed and accepted work shall be paid for at the contract unit price each for "Right of Way Markers", which price shall be full compensation for furnishing, erecting, treating and painting the posts, for inspection certifications, and for all labor, materials, tools, supplies, equipment, and incidentals necessary to complete the work, including excavation and backfill.

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